City of Santa Barbara

Climate Action Plan

September 2012

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Climate Action Plan

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B. Santa Barbara Sea Level Rise Study (Griggs & Russell 2012)

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E. City Council Resolution [reserved for Final Plan adoption]

Executive Summary

The Executive Summary provides a brief recap of the Climate Plan, including:

- *Introduction:* plan objectives, content, and background
- *Reduction of Carbon Emissions that Contribute to Climate Change:* future citywide carbon emissions targets; inventories; and forecasts
- *Adaptation to Climate Change:* types of forecasted future climate changes
- *Summary of Climate Plan Strategies:* listing of measures for carbon emissions reduction and adaptation planning.
- *Plan Implementation, Monitoring, and Update*

Introduction

The Santa Barbara Climate Action Plan addresses climate change issues for the City of Santa Barbara community in the period to the year 2030, in accordance with directives of the Santa Barbara General Plan and the California Global Warming Solutions Act (AB 32).

Purpose

Climate plan purposes: (1) reduce the rate of carbon emissions generated within the Santa Barbara community; and (2) plan for adaptation of Santa Barbara to climate changes.

Content

Carbon emissions reduction: The plan identifies carbon emissions targets for the years 2020 and 2030; citywide emissions inventories and forecasts; existing City measures in place and future strategies for reducing carbon emissions in the areas of energy efficiency and green building, renewable energy, travel and land use, vegetation, waste reduction, and water conservation.

Climate adaptation: The plan describes the types of climate changes likely to affect Santa Barbara in the future, including more frequent extreme weather events (heat waves, droughts, wildfires, winter storms, flooding); accelerated coastal erosion; changes to water supply, increased air and water pollution; geographic shifts of habitats and wildlife; and effects on local economies such as fisheries and tourism. Measures to plan for future adaptation are identified.

Background - climate science

Accelerated changes are occurring to measures of global climate, such as concentrations of carbon dioxide and other "greenhouse gases" in the atmosphere; rising average air and ocean temperatures; substantial reduction in the thickness of arctic ice sheets; and rising sea levels.

There is scientific consensus that the accelerated rates of change are the result of high and increasing amounts of greenhouse gases emitted into the atmosphere by human activities, especially combustion of fossil fuels for power generation and transportation fuel.

Weather processes are complex and there are uncertainties in predicting the exact rates, extents, and locational patterns of climate changes, but the types, trends, and accelerated pace of changes are clear.

Benefits

Actions to reduce carbon emissions and plan for adaptation involve costs, but will also have benefits to Santa Barbara not only in addressing climate change, but with other cost, economic, security, health, resource, and quality of life benefits.

Reduction of Carbon Emissions that Contribute to Climate Change

By reducing the amount of carbon emissions generated in the Santa Barbara community together with communities across the world, the extent of future climate change and severity of its impacts may be lessened.

Santa Barbara carbon emissions reduction targets

The carbon emission targets are consistent with established State and regional targets, and with City General Plan policies directing sustainability and climate protection measures. The targets are identified in metric tons of carbon dioxide equivalent ($MTCO_2e$).

- *Year 2020 target for total carbon emissions:* Reduction of overall annual Santa Barbara citywide carbon emissions to 1990 level by the year 2020, per the State AB 32 target.

  [1990 level is estimated at 724,389 $MTCO_2e$.]

- *Year 2020 and 2030 targets for per capita vehicle carbon emissions:* Zero increase in annual 2005 average per capita level of carbon emissions from passenger vehicle and light truck travel in 2020 and 2030, per the SB 375 State and regional County targets.

  [2005 level is estimated at 4.413 $MTCO_2e$/person].

Summary of citywide emissions inventories and forecasts

The following summary chart (ES-1) shows that the Santa Barbara community has already met the 2020 and 2030 carbon emissions targets. With continued implementation of existing carbon-reducing measures in place and identified future measures, these targets will continue to be met and surpassed through in the years 2030 and 2030.

Figure ES-1 – Summary of Santa Barbara Carbon Emissions Forecasts

Forecast Scenario	Annual Emissions (Metric tons CO_2e)
Citywide Total Emissions – Year 2020 (AB 32 Target)	
2007 citywide emissions inventory (baseline)	719,833
2020 target for total emissions (1990 level)	**724,388**
2020 emissions forecast –"business as usual" (with General Plan growth)	861,326
Emissions reductions needed to meet 2020 target	-136,938
Emissions reductions from State legislative measures	-179,580
2020 emissions forecast with State reductions	681,746
Emissions reductions from City climate plan	-138,561
2020 emissions forecast with State and City climate plan reductions	**543,185**
	25% below 1990 target level

Per Capita Vehicle Emissions – Year 2020 (SB 375 Target)	
2020 population forecast	92,064
2020 target for per capita on-road vehicle emissions (2005 level)	**4.413/person**
2020 vehicle emissions forecast – business as usual	5.965/person
Vehicle emissions reduction needed to meet 2020 target	-1.552/person
Vehicle emissions reductions from State legislative measures	-1.693/person
2020 vehicle emissions forecast – with State reductions	4.272/person
Vehicle emissions reduction from City climate plan	-1.176/person
2020 vehicle emissions forecast – with State and City reductions	**3.096/person**
	30% below 2005 target level

Figure ES-1 (cont.) **Forecast Scenario**	**Annual Emissions** (Metric tons CO_2e)
Per Capita Vehicle Emissions – Year 2030 (SB 375 Target[1])	
2030 population forecast	95,110
2030 target for per capita on-road vehicle emissions (2005 level)	**4.413/person**
2030 vehicle emissions forecast - business as usual	6.525/person
Vehicle emissions reduction needed to meet 2030 target	-2,112/person
Vehicle emissions reductions from State legislative measures	-2.559/person
2030 vehicle emissions forecast with State reductions	3.966/person
Vehicle emissions reductions from City climate plan measures	-2.123/person
2030 vehicle emissions forecast with State & City Climate Plan reductions	**1.843/person**
58% below 2005 target level	

[1] *The City climate plan has a planning horizon to 2030. The 2030 vehicle emissions target is a proxy for meeting the regional 2035 vehicle emissions target.*

Carbon emissions reduction strategies

A summary chart of carbon-reducing strategies is provided in Figure ES-3.

Adaptation to Climate Change

High atmospheric carbon dioxide levels are already in place and remain in the atmosphere for decades. Resulting accelerated climate changes are projected to occur over the coming decades despite efforts now to reduce the rate of manmade generation of carbon emissions.

Climate change effects and Santa Barbara vulnerability

The following chart summarizes the types of climate change effects anticipated to occur in the Santa Barbara area over the coming decades.

Figure ES-2 Summary of Potential Future Climate Change Effects	
Temperature, rainfall, extreme weather	
Temperature	2050 projection (Calif.): average temperature increases in the range of 1.82 – 5.4 degrees F; more frequent heat waves.
Precipitation	2050 projection (Calif.): average rainfall decrease of 12 – 35%; less snow pack, more droughts
Wildfires	2050 projection (Calif.): greater wildfire risk (warmer, drier conditions)
Storm events & flooding	2050 projection (Calif.): more erratic weather patterns and extreme rainstorm events, with associated storm damage and flooding.
Pests & vectors	2050 projection (Calif.): potential for altered transmission patterns for pests, vectors, and diseases.
Air pollution	2050 projection (Calif.): increased smog production and changes to pollen production; reactive nitrogen disposition affecting plants
Water pollution	2050 projection (Calif.): increased risk for pollution of streams (higher temperatures; urban runoff during intense storms); seawater intrusion into groundwater; ocean acidification affecting sea creatures.

Figure ES-2 (cont.)	**Summary of Potential Future Climate Change Effects**
Sea level rise	
Sea level rise	2030 projection (Calif.): average 7 inches rise; range 5-8 inches 2050 projection (Calif.): average 14 inches; range 10-17 inches 2070 projection (Calif.): medium average 24 inches; range 17-39 inches 2100 projection (Calif.): medium average 47 inches; range 31-69 inches
Storm damage	2050, 2100 projections (SB): sea level rise exacerbates high-magnitude storm events, affecting wave damage, flooding, erosion 2050: high probability and magnitude in Santa Barbara 2100: very high magnitude probability and magnitude in SB
Flooding and inundation	2050, 2100 projections (SB): increased areas subject to 100-year flooding; permanent inundation of some low-lying areas 2050 probability and magnitude moderate for City, high for Airport 2100 probability and magnitude high for City, very high for Airport
Beach retreat	2050, 2100 projections (SB): potential erosion or loss of beaches 2050 probability and magnitude low for Santa Barbara 2100 probability and magnitude moderate to high for City beaches
Coastal cliff erosion	2050 projection (SB): moderate probability of substantial increase in erosion rate (doubled from current 6-12 in/yr to 12-24 in/year) 2100 projection (SB): probability and vulnerability high of increased erosion rates, threatening cliff-top homes.
Tsunami	2050, 2100 projection (SB): very low probability of occurrence continues, with low risk of damage
Public services	
Water supply	2030 projection (SB): adequate SB water supply 2050, 2100 projections (Calif.): increased pressures on statewide water supplies due to less rainfall and less water storage as snow pack, with increased irrigation demand and increased population
Agriculture and food supply	2050, 2100 projections (Calif.): alterations in crop yields, growing seasons, and pest ranges due to changes in temperature, rainfall, extreme weather, and water supply.
Energy demand	2050, 2100 projections (Calif.): increased statewide energy demand with population increase, more demand for cooling, peak summer demand, utilities, water transport, and industries.
Biological resources	
Natural habitats and species	2050, 2100 projections (Calif.): varied species responses to changes in temperatures, rainfall, weather patterns, extreme events, wildfire, rising sea levels, coastal erosion, and air and water pollution. Individual species may adapt, survive in reduced ranges, migrate, or not survive. General trend to move northward anticipated.
Local economies	
Fisheries and tourism	2050, 2100 projections (Calif.): marine habitats changes could affect fishing industry. Weather events, coastal erosion could affect tourism.

Summary of Climate Plan Strategies

Figure ES-3 provides a summary listing of strategies identified to reduce carbon emissions.

Figure ES-3 Summary of Climate Plan Emission Reduction Strategies

CLIMATE PLAN STRATEGY	TARGET YEAR	CLIMATE PLAN STRATEGY	TARGET YEAR
Energy efficiency and green building measures		35. Development impact fees	2015
1. Energy-efficient City facilities	ongoing	36. Street widths	ongoing
2. Recreational field lighting efficiency	2015	37. New development vehicle emissions	2015
3. Energy-efficient buildings–voluntary actions	ongoing	38. Marine shipping emissions	ongoing
4. Energy-efficient buildings–further actions	2025	***Vegetation measures***	
5. Green building	ongoing	39. Tree planting	2030
Renewable energy measures		40. Street trees	2015, ongoing
6. Hydroelectric plant re-commissioning	2015	41. Tree and landscaping protection	2015
7. Solar photovoltaic project at airport	2015	42. Urban heat island effect	2020
8. Community choice aggregation	2030	43. Regional open space preservation	ongoing
9. Alternative/advanced fuels	2020, 2030	***Waste reduction measures***	
10. Alternative fuel infrastructure	2015	44. City business purchasing guidelines	2015
11. Small wind generators	2020	45. City facilities recycling	2015
12. Facilitate renewable energy technologies	2020	46. Electronic processes	2015
13. Solar energy	ongoing	47. City coordination with region	2020
Travel and land use measures		48. Waste-to-energy facility at landfill	2015
14. Fleet vehicles	ongoing	49. Communitywide waste diversion	2020
15. City employee travel changes	ongoing	50. Regional material recovery facility	2015
16. Mixed use land use policies	2015	51. Waste audit information for business	2015
17. Sustainable neighborhood plans	2020, 2030	52. Recycling education campaigns	2015
18. Experimental development	2015	53. Single-use packaging reduction	2015
19. Complementary land uses	2020	54. Business & MF recycling ordinance	2015
20. Electric vehicle charging stations	2015	55. Construction waste enforcement	2015
21. Pedestrian infrastructure	ongoing	56. Increased recyclables sorting	2015
22. Bicycle infrastructure improvements	ongoing	57. School waste diversion	2015
23. Personal transportation	ongoing	58. Materials reuse/recycling for builders	2015
24. Inter-model connections	ongoing	59. Building space guidelines for waste	2015
25. Optimize roadway capacity, flow	ongoing	60. Additional recycling materials	2020
26. Mid-block traffic improvements	ongoing	61. Additional green waste capacity	2020
27. Regional transportation and transit	ongoing	62. Additional recycling in public places	2020
28. Vehicle speeds	2015	63. Additional composting	2020
29. Bus pull-out right of way	2015	64. Single-use bag reduction	2015
30. Circulation improvements	ongoing	***Water conservation measures***	
31. Transit passes	ongoing	65. City facilities – water conservation	ongoing
32. Parking policies	ongoing	66. Community water conservation	2015, ongoing
33. Car-pooling and telecommuting	ongoing	67. Recycled water	2020, 2030
34. Car-sharing	ongoing	68. On-site water storage and reuse	2020

Figure ES-4 provides a summary list of strategies for climate change adaptation planning.

ES-4 Summary of Climate Plan Adaptation Planning Strategies			
Climate Plan Strategy	**Target year**	**Climate Plan Strategy**	**Target Year**
Climate change adaptation planning		85. Sea level rise adaptation	2020
69. Planning for adaptation	2020, 2030	86. Future inundation	2020
70. Coordination of climate planning efforts	ongoing	87. Bluff retreat guidelines	2015
Emergency preparedness		88. Cliff erosion policies	2020
71. Emergency response strategies	2015	89. Shoreline management plan	2020
72. Emergency workforce	2015	90. Beach erosion policies	2020
73. Public education for emergencies	2015	91. Coastal ecosystems study	2020
74. People with disabilities	2015	***Public services***	
75. Community resilience planning	2020	92. Water supply planning	2015, ongoing
Wildfire, flooding, water quality		93. Regional cooperation - water supply	ongoing
76. Residential development – high fire hazard	2015	94. Local food cultivation	2030
77. Fire prevention and creek restoration	2015	95. Community gardens	2030
78. Water system improvement for firefighting	ongoing	96. Regional agriculture	ongoing
79. Private water supplies for firefighting	ongoing	***Biological resources***	
80. Floodplain mapping update	2020	97. Wildlife and habitat protection	2020, ongoing
81. Creek resources and water quality	2025, ongoing	98. Open space connectivity and trails	2020, ongoing
Coastal vulnerability and adaptation planning		99. Creek protection, restoration	2020, ongoing
82.Sea level monitoring, data, analysis	2020	***Local economies***	
83. Sea level risk assessment and vulnerability	2020	100. Coordinate with local business	2015, ongoing
84. Incorporate adaptation in development	2015, ongoing		

Plan Implementation, Monitoring & Update

Implementation

Plan strategies will be undertaken by City departments, joint efforts with the private sector business, and through development permitting. Measures will be taken up whenever possible as part of ongoing City operations, as budgets allow. Grant funding will continue to be pursued to assist in financing.

Environmental review

The climate plan provides a refined analysis that updates the 2010 General Plan Program EIR analysis. Upon adoption, the climate plan will function as a cumulative mitigation program for climate change effects in the City of Santa Barbara.

Monitoring & plan updates

Climate plan implementation monitoring and reporting will be coordinated with the General Plan Adaptive Management Program under development. Update reports on the citywide carbon emissions inventory and climate change information will also be provided in 2015, 2020, 2025, and 2030. The next climate plan update will be slated for 2030.

1.0 Introduction

This Santa Barbara climate action plan is prepared to address climate change issues in the period to the year 2030, in accordance with directives of the Santa Barbara General Plan and the Global Warming Solutions Act (AB 32) adopted by the California Legislature in 2006.

The Introduction section presents the following information:

1.1 *Purpose, Content, & Process*: Identifies plan objectives, summarizes content, and describes plan preparation and adoption process.

1.2 *Background:* Describes overall science findings of climate changes; legislative and policy context for climate change planning; regional efforts underway; and other benefits of climate protection measures.

1.1 Purpose, Content & Process

1.1.1 Plan purpose

The scope and nature of global climate change requires that every community take actions toward lowering its contribution to global carbon emissions or "greenhouse gases" that are cumulatively resulting in accelerated climate changes. Communities also need to plan ahead for adaptation to the effects of climate change, such as extreme weather and sea level rise.

Actions to reduce the extent of climate change effects will involve costs, but will also have other cost, economic, security, health, resource, and quality of life benefits to the Santa Barbara community, and are consistent with long-time City policies and community values.

This Santa Barbara climate action plan is prepared to address climate change issues in the period to the year 2030, in accordance with directives of the Santa Barbara General Plan and the Global Warming Solutions Act (AB 32) adopted by the California Legislature in 2006.

The overall purposes of this climate plan are to:

- Reduce the rate of carbon emissions generation within the Santa Barbara community, together with the South Coast region and communities worldwide, to lessen the extent of climate change and severity of its effects, and
- Plan for adapting Santa Barbara to future climate change effects.

1.1.2 Plan content

Section 1 of the Plan, *Introduction*, identifies the purpose of the plan; summarizes plan content and processes for public input and City adoption; and provides background information on climate science findings, legislative and policy context, South Coast regional efforts, and benefits of climate protection measures.

Section 2, *Carbon Emissions Reduction*, includes citywide carbon emissions targets for 2020 and 2030; a communitywide inventory of carbon emissions in Santa Barbara and estimated future emissions forecasts; emissions reduction targets; and existing measures in place and future action strategies for reducing communitywide carbon emissions. Emissions reduction measures are identified in the areas of energy efficiency and green building, renewable energy, travel and land use, vegetation and open space, waste reduction, and water conservation.

Section 3, *Adaptation to Climate Change*, describes types of potential climate change effects and potential vulnerability of Santa Barbara. Examples are extreme weather events, flooding, coastal erosion, wildlife and vegetation changes, and changes affecting local economies. Measures to plan for adaptation to future climate changes are identified.

Section 4, *Plan Implementation, Monitoring, and Update*, summarizes measures to be taken through City operations, development permitting, and environmental review to implement the plan strategies. Processes are identified for monitoring and reporting on the implementation status of plan actions, carbon emissions level changes, and measures of climate change effects, and to periodically update targets and action measures.

Section 5, *References*, identifies plan preparers and source document references.

1.1.3 Process for plan preparation, public review, & adoption

Plan preparation

The Climate Plan was prepared by staff of the City Community Development Department/ Planning Division, with assistance from other City divisions and departments, including the Building & Safety Division, and the Public Works, Parks & Recreation, Waterfront, Airport, and Fire Departments. Assistance on the carbon emissions inventories and projections was provided by the firm AMEC Environment and Infrastructure, Inc. under contract to the City.

Existing City policy documents including the General Plan and Municipal Code informed the development of proposed policies and future action measures. An assessment of Santa Barbara's vulnerability to climate change impacts associated with sea level rise was provided by the U.C. Santa Cruz Institute of Marine Sciences. The Program EIR for the *Plan Santa Barbara* General Plan Update, State climate change guidelines, reports from Santa Barbara community organizations, and other informational sources were also used in preparing the carbon emissions inventory and identifying strategies (see Section 5, *References*).

Environmental review of the Plan under the California Environmental Quality Act (CEQA) tiered off of the full-scope, citywide Environmental Impact Report certified for the City's *Plan Santa Barbara* General Plan update.

Public review period

The draft City of Santa Barbara Climate Plan was issued for a 45-day public review and comment period in June-July 2012. Notification of the public review period was provided in the local media, and mailed to agencies and community organizations.

The plan documents are available on-line at the City web site at www.santabarbaraca.gov, and are available for review at the City Planning Division office at 630 Garden Street.

A public hearing before the City Planning Commission was held to provide an additional opportunity for input from the public and Commission. During the review period, informational reports were also provided to City Council and other City advisory boards.

Plan adoption process

Following the public review period, a proposed final draft Climate Plan is prepared and forwarded to City Council for their consideration and adoption at a noticed public hearing.

Plan implementation, monitoring, and update

Upon adoption, a variety of City departments together with the community at large will implement the plan, as identified in the individual action strategies.

As described in Section 4, the plan also provides for monitoring and reporting on the implementation of action measures for carbon emissions reduction and adaptation planning, citywide carbon emissions levels, and measures of climate change. The plan will be slated for periodic update.

1.2 Background

1.2.1 Climate science findings

The world's scientists and science institutes have a clear consensus that accelerating changes are occurring to measures of global climate. Evidence includes concentrations of carbon dioxide and other "greenhouse gases" in the atmosphere; rising average global air temperature; rising average surface temperature of the oceans (which affects extreme weather); substantial reduction in the thickness of arctic ice sheets; and rising average sea levels (*Intergovernmental Panel on Climate Change*).

These changes are already destabilizing climate processes, and over the coming decades are forecasted to create increasingly serious effects worldwide on public health and safety, resources and environment, and economies.

The following effects of climate change can be expected to occur in Santa Barbara in future decades:

- more frequent extreme weather events such as heat waves, droughts, wildfires, wind, severe winter storms, and flooding,
- accelerated coastal erosion and inundation of some coastal areas due to sea level rise
- changes to water supply from more winter runoff and less spring snow melt
- increased smog pollution and water pollution
- geographic shifts and harm to wildlife and plant species and their associated habitats
- changes to disease transmission and pest epidemics
- effects on local economies such as fisheries, tourism, and recreation

There is also scientific consensus that these accelerated climate changes are the result of the increasing worldwide amounts of greenhouse gases including carbon dioxide that are emitted into the atmosphere by human activities, such as from combustion of fossil fuels for electrical generation and transportation fuel.

These gases act like a greenhouse to trap heat in the earth's atmosphere. They absorb radiation and release it as heat to maintain the temperature of the planet. But the balance of gases in the atmosphere is upset, and the increased greenhouse gas content causes excess heat to be retained. Past weather patterns of heating and cooling since ancient times have involved CO_2 levels gradually ranging between 180 and 280 parts per million over thousands of years. The CO_2 level has now been increased to more than 380 ppm within just a few hundred years and continues to increase rapidly.

Weather processes are complex and there are uncertainties in predicting the exact rates, locational patterns, and extent of climate changes, but the types, trends, and unnatural accelerated pace of changes that are occurring are clear.

The U.S. Mayors Climate Protection Agreement

(As endorsed by the 73rd Annual U.S. Conference of Mayors meeting, Chicago 2005)

A. We urge the federal government and state governments to enact policies and programs to meet or beat the target of reducing global warming pollution levels to 7 percent below 1990 levels by 2012, including efforts to: reduce the United States' dependence on fossil fuels and accelerate the development of clean, economical energy resources and fuel-efficient technologies such as conservation, methane recovery for energy generation, waste to energy, wind and solar energy, fuel cells, efficient motor vehicles, and biofuels;

B. We urge the U.S. Congress to pass bipartisan greenhouse gas reduction legislation that 1) includes clear timetables and emissions limits and 2) a flexible, market-based system of tradable allowances among emitting industries; and

C. We will strive to meet or exceed Kyoto Protocol targets for reducing global warming pollution by taking actions in our own operations and communities such as:

1. Inventory global warming emissions in City operations and in the community, set reduction targets and create an action plan.
2. Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
3. Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit;
4. Increase the use of clean, alternative energy by, for example, investing in "green tags", advocating for the development of renewable energy resources, recovering landfill methane for energy production, and supporting the use of waste to energy technology;
5. Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
6. Purchase only Energy Star equipment and appliances for City use;
7. Practice and promote sustainable building practices using the U.S. Green Building Council's LEED program or a similar system;
8. Increase the average fuel efficiency of municipal fleet vehicles; reduce the number of vehicles; launch an employee education program including anti-idling messages; convert diesel vehicles to bio-diesel;
9. Evaluate opportunities to increase pump efficiency in water and wastewater systems; recover wastewater treatment methane for energy production;
10. Increase recycling rates in City operations and in the community;
11. Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO2; and
12. Help educate the public, schools, other jurisdictions, professional associations, business and industry about reducing global warming pollution.

Figure 1-1 2005 U.S. Mayors Climate Protection Agreement

1.2.2 Legislative and policy context

Throughout the world, individuals, groups, communities, industries, and governments are working to identify and implement measures that can reduce greenhouse gas emissions, to lessen the future extent of climate change and therefore the extent and severity of its effects.

Mayors' 2005 Climate Protection Agreement

In 2005, the U. S. Mayors' Climate Protection Agreement was endorsed by then-Mayor Marty Blum of Santa Barbara along with mayors of 1054 other cities across the nation representing a population of approximately 88,500,000 (see Figure 1-1).

The Agreement directed that cities work to meet or surpass the international carbon emission reduction targets identified in the Kyoto Protocol. The targets identified reduction of annual carbon emissions to 7% below 1990 levels by 2012, through changes in City government operations as well as with policies for the larger community pertaining to energy, land use, transportation, vegetation, waste, and water.

Since that time, concerted efforts by Santa Barbara City departments resulted in already surpassing the Kyoto carbon emission reduction targets for City government operations. In 2007 Santa Barbara certified its first annual greenhouse gas emissions inventory for City operations through the California Climate Action Registry, one of the first cities in the nation to do so. The 2008 inventory demonstrated that City operations had achieved and surpassed the Kyoto Protocol target. Annual carbon emissions for 2010 City operations were more than 16% below 1990 levels.

Efforts within the larger Santa Barbara community have also been continuing to implement measures that reduce carbon emissions (see further discussion in Section 2.3 Carbon Emission Reduction Strategies.)

Governor's 2005 Executive Order

Also in 2005, then-Governor Schwarzenegger signed Executive Order (EO) S-3-50 establishing carbon emission reduction targets for California that called for a statewide reduction to year 2000 emission levels by 2010, a reduction to 1990 levels by 2020, and a reduction to 80% below 1990 levels by 2050.

AB 32: 2006 Global Warming Solutions Act

To implement the State EO S-3-50 carbon emission reduction target for the year 2020 (reduction to 1990 levels), the California Legislature adopted Assembly Bill (AB) 32, which directed the California Air Resources Board (CARB) to develop a Scoping Plan to identify carbon emission reduction measures that could be taken by different economic sectors. The year 2020 target to reduce to 1990 levels was quantified to reflect an estimated 15% reduction from 2005 levels.

The 2008 Scoping Plan and 2011 Scoping Plan Supplement identify suggested carbon emission reduction measures and their estimated effectiveness in meeting California's reduction goals.

Some of the measures would be implemented through State action (e.g., vehicle emissions standards; emissions cap-and-trade program), some measures through specific economic sectors (e.g., industrial and agricultural emissions), and others through local governments, community actions, and individuals. (See Figure 1-2 for summary of planned State actions).

Figure 1-2 Planned State Actions for Carbon Emissions Reduction
Emissions Cap-and-Trade program and complementary measures
Vehicle standards (Pavley I and II standards – light-duty vehicles)
Energy efficiency (building/appliance efficiency; increase combined heat and power (CHP) generation by 30,000 GWh); solar water heating.
Renewable energy (renewables portfolio standard: 33% by 2020)
Fuel standard (low carbon fuel standard)
Regional transportation (regional vehicle carbon emissions targets)
Goods movement (ship electrification at ports; system-wide efficiency improvements)
Solar energy (million solar roofs)
Medium/heavy duty vehicles (aerodynamic efficiency; vehicle hybridization)
Rail (high speed rail project)
Industrial (refinery measures; energy efficiency and co-benefit audits)
Un-Capped sources and sectors
High global warming activities (gas measures)
Trees (sustainable forests)
Oil and gas (extraction and transmission)
Recycling and waste (landfill methane capture)

[Calif. Air Resources Board]

Suggested local government and community measures identified in the State Scoping Plan center around the following actions:

- *improve energy efficiency* to reduce carbon emissions associated with electricity generated from fossil fuel combustion;
- *increase the use of alternative energy sources* such as solar power to reduce carbon emissions from power generation;
- *use "green" building designs and products* that reduce carbon emissions;
- *reduce passenger vehicle trips and mileage* to reduce fuel combustion carbon emissions;
- *maintain or increase vegetation* that sequesters carbon dioxide;
- *reduce solid waste and increase reuse and recycling* to reduce carbon emissions generated from materials production and landfills; and
- *increase water conservation* to reduce carbon emissions associated with energy used in water supply management.

Other State climate change legislation

Senate Bill (SB) 375 (2008) addresses the portion of AB 32 pertaining to reduction of passenger vehicle carbon emissions. The legislation directs the coordination of transportation, land use, housing, and employment planning at the regional level (e.g., Santa Barbara County) to help reduce vehicle miles travelled (see further discussion below in Section 1.2.3 Regional Efforts).

SB 97 (2007) directs California Environmental Quality Act (CEQA) and CEQA Guidelines amendments that require environmental review of individual development projects and other activities to include analysis of climate change impacts and mitigation to reduce carbon emissions. This also establishes that public agencies may provide for a communitywide emissions mitigation program through an adopted climate action plan. SB 226 (2011) was also adopted to provide for streamlining of environmental review procedures for in-fill development projects that are expected to limit greenhouse gas generation.

Other California legislation pertaining to climate change since the year 2000 addresses carbon emissions inventories and registries; vehicle emissions standards (2002 AB 1493 Pavley); electricity carbon standards; carbon dioxide sequestration; waste heat carbon emissions reduction; water efficiency in building standards; solar water heating; lighting efficiency; renewable energy resources; water conservation; solar energy; government motor vehicle fleets; and alternative fuels and vehicle technologies.

Federal activities and regulations

In 1992, the United States signed and ratified the United Nations Framework Convention on Climate Change, which identified the eventual objective to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with climate systems from human activities.

On April 2, 2007, the Supreme Court found that greenhouse gases, including carbon dioxide, are air pollutants covered by the Federal Clean Air Act (Massachusetts v. EPA, 549 U.S. 497 (2007). The U.S. Environmental Protection Agency (US EPA) is the Federal agency responsible for implementing the Clean Air Act.

In January 2011, US EPA rules went into effect for the largest industrial facilities, such as power plants and refineries, which together generate about 70 percent of greenhouse gas emissions from stationary sources nationally. Under these regulations, large facilities require permits covering greenhouse gas emissions as part of existing Clean Air Act permitting programs (New Source Review/Prevention of Significant Deterioration, and Title V Operating Permits). Federal vehicle regulations in 2012 require doubling of average gas mileage to 54.4 miles per gallon by 2025 for new passenger vehicles sold.

The Federal government has taken a number of other actions in recent years that support energy conservation and carbon emissions reduction, including the following:

- U.S. Global Change Research Program (1990)
- Recovery Act investment of $90 billion in clean energy (2010)
- U.S. government greenhouse gas emissions inventory (2010)

- Fuel economy standards for model year 2012-2016 vehicles (2011)
- Inventory of all large sources of carbon emissions initiated (2011)
- Federal agencies were directed to reduce carbon emissions from direct sources (building energy, vehicle fuel combustion) by 28% by 2020, and from indirect sources (employee travel and commuting) by 13% by 2020. (2011)

State & Federal climate change adaptation activities

Federal and State governments are also recognizing that communities need to begin planning for adaptation to climate changes.

A Federal interagency task force report identified recommendations for a national climate adaptation strategy (CEQ October 2010), including improving local accessibility to scientific information, and building partnerships with local agencies for management of places and infrastructure affected by climate change.

Governor's Executive Order S-13-08 directed State planning efforts for climate change adaptation, including sea level rise studies, assessment of transportation system vulnerability to sea level rise, and preparation of an adaptation strategy report.

The 2009 California Climate Adaptation Strategy report addresses issues of public health, biodiversity and habitat, ocean and coastal resources, water management, agriculture, forestry, and transportation and energy infrastructure.

In 2011, the California Energy Commission also launched the Cal-Adapt.org web site that provides scientific information and interactive tools to assist in planning for climate change adaptation.

1.2.3 Regional efforts

Reducing vehicle emissions

With an established land use and transportation pattern oriented to individual vehicle travel, it is a challenge throughout California to identify ways to reduce vehicular carbon emissions.

Efforts by the State include establishing more stringent vehicle emission standards, requiring reduced emissions in government fleets, and providing funding support for alternative fuel and vehicle technologies. Industry efforts continue toward developing alternative fuel vehicles and low-emission vehicles.

In addition, State legislation SB 375 directs efforts by regional Metropolitan Planning Organizations (MPOs) throughout the State to find ways to reduce vehicle miles travelled through the development of Sustainable Communities Strategies that coordinate regional transportation, land use, housing, and employment planning.

The Santa Barbara County Association of Governments (SBCAG), which includes representatives of each of the cities and the County, is engaged in developing a Sustainable Communities Strategy for the Santa Barbara County region.

Per AB 375 requirements, the California Air Resources Board (CARB) identified per capita annual vehicle miles reduction targets for each MPO region of the State. The primary focus for statewide reductions was identified to be the large metropolitan areas that are responsible for the majority of the State's vehicle carbon emissions.

The smallest six MPOs, which include Santa Barbara County, together account for only about 5% of the State's vehicle miles travelled and associated carbon emissions. In 2010, SBCAG and CARB adopted regional targets for the Santa Barbara County region. The established targets for both the years 2020 and 2035 are zero net increase in per capita annual vehicular carbon emissions from 2005 levels within Santa Barbara County.

Air district

Santa Barbara County Air Pollution Control District activities related to climate change and greenhouse gas emissions include the following:

- Incorporation of greenhouse gas emissions into large industrial source permits as required by federal law
- Updating and refining the District's countywide greenhouse gas emissions inventory
- Working with individual jurisdictions to quantify and mitigate greenhouse gas emissions associated with development projects
- Participation in working groups to update and improve greenhouse gas quantification and mitigation tools statewide
- Working with the California Air Resources Board to implement AB 32 scoping plan measures as necessary
- Updated environmental review guidelines that address carbon emissions (*Scope and Content of Environmental Review Documents, December 2011*), and held a public workshop to discuss development of greenhouse gas emissions thresholds, including options for numeric thresholds for stationary sources, for use in evaluating environmental impacts of projects within Santa Barbara County..

Regional climate change adaptation planning

In 2011, the County of Santa Barbara worked with cities, as well as the Federal Emergency Management Agency (FEMA) and Cal EMA, to develop an updated Multi-Jurisdiction Multi-Hazard Mitigation Plan for Santa Barbara County under provisions of the Federal Disaster Mitigation Act of 2000. The Plan identifies local vulnerability to flooding, wildfire, earthquakes, tsunamis, landslides, coastal erosion, and dam failure, and establishes pre-planning measures that can help to avoid or reduce the effects of natural disasters. The Santa Barbara chapter of the Plan (2012) identifies hazard vulnerabilities and pre-planning measures for the City.

This has relevance to future climate change adaptation planning because some climate change effects will involve changes to the timing, frequency, and intensity of weather patterns that can result in more extreme weather events (rainstorms, winds, etc.) as well as greater potential for natural disasters (wildfires, flooding, etc.).

1.2.4 Other benefits of climate protection measures

In addition to providing climate protection, actions that reduce carbon emissions have other community benefits, including economic, security, resource, and public health benefits.

Cost savings

Actions by governments, businesses, and individuals to reduce carbon emissions in many cases have up-front costs, for example for installing more energy-efficient equipment. These costs can be a serious constraint to proceeding with such measures. However, over the longer-term, such costs may pay for themselves with operational cost savings resulting in overall cost savings.

Recent examples from government, institutional, and business operations in Santa Barbara demonstrate the type of cost savings that can occur *(Public Works Department and 2010 Sustainability Achievement Report)*:

- Energy efficiency audits and retrofits of City of Santa Barbara facilities resulted in savings of almost $400,000 in annual operations costs.
- Solar energy panels installed at the City of Santa Barbara Corporate Yard generate 87% of the electricity needed for Community Development, Public Works, and Parks operations.
- The Santa Barbara School District waste recycling and composting program has diverted 56% of waste from landfill disposal, saving an estimated $90,000 per year in disposal costs.
- Shoreline Café estimates an annual savings of $15,000 due to energy management changes and retrofits.

Cost savings would accrue to individual homes and businesses throughout the community from instituting similar types of measures, as shown in the following example estimates (from *2010 Sustainability Achievement Report and City Water Resources Division)*

Figure 1-3 Energy efficiency cost savings examples

Average home electricity use		
	Annual electric use (est.)	Annual electric bill (est.)
Energy inefficient home	8,500 kWh	$ 1,200
Energy efficient home	4,250 kWh	$ 600
Cost savings		$ 600/ year
Average home and landscape water use		
	Monthly water use (est.)	Monthly water bill (est.)
Water inefficient home	30,000 gallons	$ 203.00
Water efficient home	9,000 gallons	$ 69.50
Cost savings		$ 1,602/ year
Restaurant – typical waste		
	Waste diversion (est.)	Monthly collection bill (est.)
Trash collection only	0 %	$ 475
Recycling, composting, &trash collection	67 %	$ 200
Cost savings		$ 3,300/ year

Other economic and jobs benefits

Programs and actions that reduce carbon emissions may also generate new businesses and jobs that benefit the community and local economy. Examples are research and production of new technologies, retrofitting existing buildings for energy efficiency; providing local renewable energy sources (e.g., solar, wind, wave, geothermal, waste-to-energy); providing alternative travel products and services; providing sustainable agricultural and gardening services and products; and providing green building, recycling, and water conservation services and products.

California companies and universities have received substantial energy grant funding in recent years. Economic studies in California have concluded that incentives for industries to invest in new technologies can provide stimulus for new employment and growth.

Actions to benefit and preserve the local environment also act to help local economies such as tourism, recreation, fisheries, and agriculture.

Enhanced security

Fossil fuels are a limited resource and worldwide resources are considered to be declining, with remaining resources more difficult and expensive to extract. At the same time, some large industrializing counties such as China and other Asian nations have increasing energy demands that are anticipated to increase competition for these scarce resources in coming decades, and drive up costs.

With about five percent of the world's population, the United States consumes about 20% of the world's energy use. Approximately 63% of U.S. oil demand is supplied from foreign imports (more than 3 billion barrels imported annually), some from regions that are politically unstable.

Climate protection measures that conserve electricity and vehicle fuels, or use alternative energy sources such as solar energy, have the added community benefits of reducing our dependence on foreign sources of fossil fuels, and conserving our own oil and gas resources and supplies for a longer period.

Resource benefits

Energy conservation, water conservation, and waste reduction/recycling measures that reduce carbon emissions also have the individual and community benefits of conserving those energy, water, and material resources, as well as landfill capacity for waste disposal.

Conserving limited resources and avoiding waste is a key component of local community sustainability. Sustainability means the wise use of resources in a way that does not damage future generations, and also allows for local reliance in the face of natural disasters.

Public health and quality of life

Carbon emissions reduction measures also have the individual and community benefits of reducing air pollutants and improving air quality.

Some measures that make it easier to use alternatives to a single-occupant vehicle for transport have added individual and community health benefits from increased physical activity. Examples include measures increasing the connections of walking and bicycling routes, and mixed use (commercial/residential) development patterns that put residential uses within walking distance of daily business, shopping, and recreational locations.

Actions that reduce energy use, air pollution, water pollution, traffic, and noise all benefit public health as well as quality of life in a community.

Figure 1-4 Example measures individuals can take to reduce carbon emissions
Electrical energy reduction
Turn the water heater thermostat down to 120^{o}.
Turn lights off when leaving a room, and unplug items not in use or use a power strip to cut power (*20% of home electricity use is items that are turned off*)
Keep drapes open in winter daylight to let sunlight heat home; closed in summer to cool and closed after sunset in winter to retain heat
Set the thermostat as low as comfortable in winter, and as high as comfortable in summer; close heating and air conditioning vents in unused rooms
Check lighting needs and consider reducing the number and wattage of bulbs
Wash full loads of laundry and dishes, use cold water, and air dry when possible; use energy-saving settings on washing machines, clothes dryers, dishwashers, and refrigerators
Clean refrigerator condenser coils yearly
Use lighting occupancy sensors, timers, and dimmers
Upgrade to more energy-efficient appliances (refrigerator, etc.)
Install upgraded double-pane windows
Install solar photo-voltaic panels that generate electric energy
Do a home energy audit using electric utility on-line audit or arrange for a home visit audit.
Transportation
Drive less, & take fewer solo vehicle trips, by walking, biking, taking bus or train, carpooling
Use electronic means to accomplish some activities without a vehicle trip
Combine car trips for several purposes
Keep your car tuned up, and tire pressure up
Arrange to telecommute one day per week or more
Consider a hybrid, all-electric, or alternative fuel vehicle
Vegetation and green building & materials
Reduce the amount of paved area and increase the amount of trees and vegetated areas
Use natural materials, finishes, & paints with less off-gassing in new structures & furnishings
Incorporate passive heating and cooling in new structure and landscape designs
Offsets
Purchase offset emissions from organizations or companies, e.g. when taking flights or to offset other emission-generating activities

Figure 1-4 *(continued)* M**easures an individual can take to reduce carbon emissions**
Waste reduction and recycling
Use reusable mugs and shopping bags rather than disposable ones
Convert some activities from paper to electronic
Print double-sided documents to cut paper use in half
Maintain and repair durable items
Recycle most paper, bottles, cans, and plastic, as well as electronic items
Compost foodscraps and use for soil amendment
Purchase items made from materials with recycled content, and items that can be recycled
Water conservation
Check for leaks in both inside and outside water systems and have them repaired. Check toilets for silent leaks (drop food coloring or dye tab into tank, if color appears in bowl after 10 minutes, replace rubber flapper)
Sweep rather than hose walkways
Install water-efficient plumbing fixtures and appliances (such as shower-heads, sink faucets, toilets, clothes washers, and a timed, circulating water pump on the hot water heater)
Schedule your water softener to regenerate no more than twice a week
Reduce lawn size
Wash full loads of laundry and dishes
Take shorter showers, and turn off the water while brushing teeth
Water landscaping infrequently but thoroughly to increase root depth
Use water wise plants for landscaping, including native, drought-tolerant species
Use mulch or decomposed granite in landscaping to lock in moisture and reduce evaporation
Install a smart controller on a water sprinkler that adjusts watering based on weather, soil type, amount of sunlight, and plant type. Use online irrigation scheduling tools (weekly watering index, and landscape watering calculator) to adjust watering to the weather
Install a rain shut-off sensor to automatically stop sprinklers during and after a rain event
Adjust your sprinkler pressure to minimize misting and overspray. Switch your sprinkler heads to rotating nozzles to apply water slowly and evenly. Check and replace old sprinkler timer batteries
Retrofit overhead sprinklers to a drip irrigation system
Install a laundry-to-landscape gray water system to reuse wash water for irrigation
Install rain barrels or cisterns to catch rainwater to irrigate your landscape
Water plants in the early morning or evening to reduce evaporation
When washing your car, use a bucket instead of a running hose. Wash it on lawn to contain runoff

2.0 Reducing Carbon Emissions That Contribute to Climate Change

Carbon emissions generated in Santa Barbara contribute to the cumulative emissions worldwide that are causing accelerated climate change. Reducing the amount of these emissions in Santa Barbara, together with communities across the world, is intended to lessen the extent of future climate change and severity of its impacts.

This section describes present and planned City efforts in the Santa Barbara community and City government operations that would reduce the level of carbon emissions, especially from ongoing activities involving oil and gas combustion for electricity and travel fuel. Information presented includes:

2.1 *Emission Reduction Targets:* Citywide carbon emission reduction targets for the years 2020 and 2030, for total annual emissions and per capita annual vehicle emissions.

2.2 *Emission Inventories and Forecasts:* Carbon emissions generation from Santa Barbara (citywide and City government operations) are estimated for past years (1990 and 2005), baseline year (2007), and present (2010). Citywide emissions are forecasted for future years 2020 and 2030 without the Climate Plan strategies ("Without Plan").

2.3 *Emission Reduction Strategies:* Describes current measures in place and planned future actions to reduce carbon emissions.

2.4 *Effectiveness of Strategies*: Identifies estimated future carbon emission reductions associated with the Plan strategies, and comparison of a "With Plan" forecast to the emissions reduction targets.

2.1 Carbon Emissions Targets

This section describes future citywide carbon emissions targets for the city of Santa Barbara.

2.1.1 Policy guidance for carbon emissions targets

International carbon emissions targets

The Kyoto Protocol (signed at 1997 United Nations Framework Convention on Climate Change, effective 2005) is an agreement establishing targets for participating developed countries to reduce carbon emissions by an average of 5% percent below 1990 levels by 2012. The United States is not a party to the Kyoto Protocol.

However, the U.S. Mayors 2005 Climate Protection Agreement directed cities to work towards meeting or exceeding the Kyoto targets in their communities and government operations (referencing 7% below 1990 levels by 2012). This Agreement was endorsed by the mayors of 1054 U.S. cities, including Santa Barbara.

Federal carbon emissions targets

There are presently no overall federal legislative policy goals or plan for national carbon emissions reduction. In connection with pending 2009 legislation by Congress and discussions prior to the Copenhagen international climate change summit, the Administration proposed a goal of carbon emission reductions of 17% below 2005 levels by 2020, however this idea has not been established as a national policy goal.

The President's Executive Order 13514 in 2009 does require federal departments to establish emission reduction goals, and the Environmental Protection Agency is promulgating regulations for stationary sources under Clean Air Act provisions. Federal vehicle regulations require doubling of average gas mileage to 54.5 miles per gallons by 2025 for new cars and trucks sold.

California carbon emissions targets

California emits about 2% of worldwide carbon emissions. The Governor's Executive Order S-3-50 and Assembly Bill (AB) 32, the Global Warming Solutions Act, establish a California target for *reduction of annual statewide carbon emissions generation to 1990 levels by the year 2020*.

The California Air Resources Board (CARB) Climate Change Scoping Plan (2008) quantified the 2020 statewide target as 427 million metric tons of carbon dioxide equivalent ($MMTCO_2e$), about a 15% reduction.

The CARB Scoping Plan recommends that local agencies also pursue a 2020 target to reduce carbon emissions to 1990 levels within their jurisdictions, generally about 15% less than baseline levels in the period of 2005 – 2008.

Regional County carbon emissions targets

The California Legislature enacted Senate Bill (SB) 375, the Sustainable Communities and Climate Protection Act of 2008, with the intent of reducing the portion of greenhouse gas emissions resulting from passenger vehicle travel by establishing a process to integrate land use and transportation planning.

The legislation requires each of the State's Metropolitan Planning Organizations (MPOs) to prepare a regional sustainable communities strategy with coordinated policies for land use development and transportation to reduce carbon emissions from passenger vehicles. The Santa Barbara County Association of Governments (SBCAG) has begun a process to develop a sustainable community strategy for the Santa Barbara County region.

SB 375 directed the California Air Resources Board (CARB) to provide each MPO region with greenhouse gas emission reduction targets (regional targets) for the automobile and light truck sector for the years 2020 and 2035. The focus for statewide reductions was identified as large metropolitan areas that are responsible for the majority of the State's vehicle carbon emissions. In September 2010, CARB and SBCAG established regional targets for Santa Barbara County of *zero increase in per capita vehicle emissions from 2005 levels in the years 2020 and 2035*.

2.1.2 Santa Barbara carbon emissions targets

The Santa Barbara community carbon emissions targets for the years 2020 and 2030 correlate with City General Plan policies directing greater sustainability and climate protection measures. The targets are consistent with the established State and regional emissions targets discussed above. Emissions are considered in metric tons of carbon dioxide equivalent ($MTCO_2e$).

Figure 2-1 Citywide Annual Carbon Emissions Targets for 2020 and 2030
(metric tons carbon dioxide equivalents MTCo2e)

Total annual citywide carbon emissions (year 2020 target):	1990 level of total annual citywide carbon emissions, per the State AB 32 target. [estimated at 724,389 $MTCO_2e$]
Annual per capita vehicle carbon emissions (year 2020 and 2030 target):	2005 level of annual per capita carbon emissions from passenger vehicle and light truck travel, per the SB 375 State and regional County target. [estimated at 4.413 $MTCO_2e$/person].

[Note: This City climate plan has a planning horizon to 2030. The 2030 City vehicle emissions target is a proxy for the regional 2035 target.]

2.1.3 Longer-range emissions reduction planning

The general goal and expectation of ongoing State and local planning for climate change is to continue to reduce carbon emissions past the year 2030 and through to the end of the century. Governor Swartzenagger's Executive Order S-3-50 had identified a general goal of statewide annual emissions reduction to 80% below 1990 levels by the year 2050. President Obama's 2009 proposal identified a goal of 83% reductions by 2050. Such longer-range goals have not yet been incorporated into legislative measures applicable to local jurisdictions.

Forecasting carbon emissions generation further into the future beyond 2030 becomes more problematic and speculative, as key variables affecting the forecasts cannot be predicted that far in advance. For example, there may be many technological changes by 2050 that could change emissions generation rates, such as those pertaining to alternative vehicles and fuels, renewable energy, and post-combustion carbon capture for power generation. There could be future legislative actions providing additional incentives or regulations that could greatly affect statewide energy consumption or travel emissions from particular sectors or all sectors. Future changes in the overall economy, and specific economic factors such as market prices for energy also have substantial effects on emissions rates. As such, there is a broad range of possible assumptions that could be employed in forecasting, resulting in a wide range of potential future emissions levels and a large margin of error.

Similarly, it is problematic to attempt identifying action programs to be implemented that far into the future. Conditions in those future times cannot be reasonably predicted, so the feasibility and effects of future measures cannot be reasonably assessed without substantial speculation.

This climate plan has a planning horizon to the year 2030, with the expectation of future plan updates based on initial plan implementation and monitoring of emissions levels. Emissions targets for longer-range periods and any additional future carbon emissions reduction programs will be revisited in subsequent plan updates.

2.2 Carbon Emissions Inventories and Forecasts

In this section, estimated past, present, and forecasted future levels of annual carbon emissions generated by the Santa Barbara community as a whole are presented.

A baseline year of 2007 is used for the carbon emissions inventories and projections. An update for 2010 is also provided to characterize current conditions. An emissions estimate for City government operations is also provided.

Estimates of past annual community carbon emissions levels in the years 1990 and 2005 are identified for the purpose of comparing forecasted future emissions with State and regional targets that use the lower emission levels of those past years.

Forecasted future citywide carbon emissions are estimated for Santa Barbara in the years 2020 and 2030 for carbon-generating activities involving electricity and natural gas use, travel and equipment fuels, and landfill methane emissions. The forecasts are based on estimated incremental future development under adopted City General Plan growth policies and use of the Santa Barbara traffic model developed for the recent General Plan update. The emissions forecasts also incorporate assumptions to account for recent State legislative actions that would reduce future carbon emissions across the State (e.g., renewable energy standard; vehicle emissions standards).

2.2.1 Methodology

Sources of carbon emissions

Greenhouse gases are identified as including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), as well as smaller contributions from hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (CA Health & Safety Code Section 38505(g))*. As a shortcut, this document refers to “carbon emissions” or “greenhouse gas emissions”.

The large increase in atmospheric concentration of carbon dioxide in the period since the Industrial Revolution has been identified by scientists worldwide to be primarily due to cumulative combustion of fossil fuels such as oil and gas (e.g., for electricity production, travel fuels) and land use changes (e.g., deforestation, desertification, urban sprawl). Increases in methane and nitrous oxide are identified as primarily due to agricultural expansion and intensification, and methane is a gas bi-product from waste decay at landfills and wastewater treatment plants.

* Hydroflurorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur haxafluroride (SF6) are chemicals used in specialty industrial processes. These chemicals have high global warming potential but represent a small fraction of total greenhouse gas emissions. They are subject to federal regulation. HFCs and PFCs are used in low-temperature refrigerants, foam-blowing and fire suppression, plasma etching and cleaning solvents in semiconductor production, and aerosol propellants. Formerly in aerosol propellant use, SF6 is used as a cover gas in magnesium production, casting dielectric gas and insulator in electric power equipment fire suppression, and as a discharge agent in military systems (www.epa.gov/ozone).

Sources of emissions included in the Santa Barbara estimates are on-road vehicle trip emissions; off-road vehicle and equipment emissions; natural gas and electricity consumption (Santa Barbara share of power generation emissions); Santa Barbara share of electricity use associated with State Water Project transport, and Santa Barbara share of landfill methane emissions.

Emissions are classified per the California Air Resources Board Scoping Plan as: Scope 1 emissions (direct CO_2 emissions released in Santa Barbara, such as from vehicle emissions and natural gas use); Scope 2 emissions (indirect emissions released outside of Santa Barbara, such as associated with electrical power generation and State Water Project water transport serving Santa Barbara power and water consumption); and Scope 3 emissions (miscellaneous emissions, including landfill methane releases).

Calculations of citywide carbon emissions inventories and forecasts

Estimates for annual carbon dioxide and other greenhouse gas emissions generated citywide in Santa Barbara for the years analyzed were calculated using the computer software package Clean Air & Climate Protection (CACP, 2009).

The CACP computer software calculates the amount of carbon dioxide equivalent (CO_2e) emissions in metric tons (MT) associated with the identified electricity, natural gas, vehicle and equipment fuel use, and methane gas generation.

Inventories and forecasts of citywide carbon emissions were initially prepared as part of the Program Environmental Impact Report (EIR) certified in September 2010 for the *Plan Santa Barbara* General Plan Update. The citywide inventories and forecasts provided for this climate plan represent a refinement of those initial inventories and forecasts. Emissions inventories for City government operations have also been calculated since 2005, and represent a subset of the citywide emissions inventories.

2.2.2 Past & present community carbon emissions generation (1990, 2005, 2007 baseline, 2010 estimates)

The following describes calculation of past and present annual carbon emissions generation in the Santa Barbara community. Figure 2.1 provides emissions inventories for 1990, 2005, 2007, and 2010.

Baseline carbon emissions inventory (2007)

As part of the *Plan Santa Barbara* General Plan analysis, the year 2007 was selected as the baseline year for characterizing a community carbon emissions inventory because that was the most recent year with available comprehensive utility and travel data. The County of Santa Barbara, City of Goleta, and Santa Barbara County Association of Governments are also using 2007 as a baseline year, which will facilitate regional coordination on inventories and reduction programs on the South Coast and countywide.

The 2007 baseline inventory of carbon emissions generation in Santa Barbara was calculated by identifying estimated energy use (electricity and natural gas) for resident population and non-residential land uses (commercial, institutional, industrial, etc.). Numbers of residents and square footage of non-residential land uses were provided from census information and the City Planning Division's land use database. Information on electric and natural gas usage in 2007 was provided by utility companies.

Average numbers and lengths of vehicle trips for different land uses were obtained from information in the citywide traffic model for the *Plan Santa Barbara* General Plan update. In addition, the community's share of electricity used to transport State water, and landfill gas emissions associated with annual community solid waste disposal were calculated.

The 2007 inventory is a refinement to earlier work done in the General Plan Program Environmental Impact Report. The refinements reflect ongoing work statewide to improve and standardize methods for estimating communitywide carbon emissions inventories and forecasts. Assumptions used in calculating the emissions inventory are detailed in Appendix A.

Past carbon emissions inventories (1990, 2005)

An estimate of past carbon emissions generated in Santa Barbara in the year 2005 was identified by "back casting" from the 2007 inventory. The estimate for this year is provided for the purpose of comparing forecasted future citywide vehicle emissions to the 2020 and 2035 regional SB 375 vehicle emissions targets for Santa Barbara County (zero net increase in per capita carbon vehicle emissions from 2005 per capita levels).

Past emissions generated in Santa Barbara in the year 1990 were estimated for comparison of projected future total citywide emissions to the AB 32 target for the year 2020 (reduction of overall carbon emissions generation to 1990 levels). The back casts used data and trend lines from prior years (e.g., utility use). Where available 1990 data was lacking (e.g. vehicle trip generation), the methodology identified by the California Air Resources Board (CARB) AB 32 Scoping Plan was used, which estimates 1990 emissions levels at 15% less than 2005 levels.

Current carbon emissions inventory (2010)

A 2010 citywide carbon emissions inventory provides a more recent update to better characterize present levels of community carbon emissions generation, and also provides an additional trend point from the 2007 baseline to assist in future forecasts. The 2010 emissions inventory used utility, land use, trip generation, and census population data.

Trends

The past (1990, 2005), baseline (2007), and present (2010) communitywide emissions inventories show vehicle emissions first increasing and then beginning to level off. Electricity consumption emissions and landfill emissions show decreasing trends due to measures already put in place. Off-road construction vehicle and equipment emissions and commercial natural gas consumption emissions show increasing trends. Estimates of overall emissions levels for 2007 and 2010 already meet the 2020 target of reducing to 1990 levels.

Figure 2-2 Past and Present Santa Barbara Citywide Carbon Emissions
(annual metric tons CO_2e)

	1990	2005	2007	2010
Population	85,571	90,160	89,234	88,410
Scope 1 Emissions *(direct emissions within City)*				
On-Road Vehicle Emissions				
Internal City Trips	120,814	149,757	149,585	146,567
Commute Trips	61,566	76,315	77,094	76,372
Other Non-Internal Trips	138,612	171,818	179,155	182,792
Subtotal – On-Road Vehicle Emissions	*320,992*	*397,890*	*405,834*	*405,731*
Per Capita On-Road Vehicle Emissions	*3.751*	*4.413*	*4.548*	*4.589*
Off-Road Vehicle/Equipment Emissions				
Construction	20,301	27,317	27,632	28,057
Industrial/Commercial Equipment	7,497	7,408	7,278	7,137
Lawn and Garden	1,421	1,459	1,446	1,414
Miscellaneous Equipment	2,066	2,456	2,640	2,964
Subtotal Off-Road Vehicle/Equipment Emissions	*31,285*	*38,640*	*38,997*	*39,573*
Per Capita Off-Road Vehicle/Equipment Emissions	*0.366*	*0.429*	*0.437*	*0.448*
Natural Gas Consumption				
Residential	76,363	75,636	73,090	73,237
Commercial	35,603	41,097	42,182	44,002
Industrial	1,191	539	579	543
Subtotal – Natural Gas Consumption Emissions	*113,157*	*117,272*	*115,851*	*117,782*
Per Capita Natural Gas Consumption Emissions	*1.322*	*1.301*	*1.298*	*1.332*
Landfill Decomposition				
Subtotal - Las Positas Landfill Decomposition	*20,578*	*9,720*	*8,794*	*7,592*
Per Capita Landfill Decomposition Emissions	*0.240*	*0.108*	*0.099*	*0.086*
Subtotal – Scope 1 Emissions	***486,012***	***563,522***	***569,476***	***570,678***
Per Capita – Scope 1 Emissions	***5.680***	***6.250***	***6.382***	***6.455***
Scope 2 Emissions *(indirect emissions outside City from City electricity and water consumption)*				
Electricity Consumption within City				
Residential	68,615	50,317	48,667	45,778
Commercial	71,227	71,727	69,107	62,262
Industrial/Institutional	61,413	25,944	24,972	22,554
Water Pumping	2,049	1,438	1,453	1,455
Street Lighting	1,783	773	1,265	1,169
Subtotal Electricity Consumption Emissions	***205,087***	***150,199***	***145,464***	***133,218***
Per Capita Electricity Consumption Emissions	2.397	1.666	1.630	1.507
State Water Project Electricity Consumption				
Subtotal State Water Project Electricity Consumption	***0***	***1,077***	***461***	***607***
Per Capita State Water Project Electricity Consumption	0	0.01	0.005	0.007
Subtotal Scope 2 Emissions	**205,087**	**151,276**	**145,925**	**133,825**
Per Capita Scope 2 Emissions	**2.397**	**1.678**	**1.635**	**1.514**
Scope 3 Emissions (*miscellaneous and lifecycle emissions outside City)*				
Landfill Decomposition				
Tajiguas Landfill Emissions - Annual Waste	33,289	5,068	4,432	3,796
Subtotal Scope 3 – Tajiguas Landfill Emissions	***33,289***	***5,086***	***4,432***	***3,796***
Per Capita Scope 3 Tajiguas Landfill Emissions	***0.389***	***0.056***	***0.050***	***0.043***
TOTAL ANNUAL COMMUNITY EMISSIONS	**724,388**	**719,866**	**719,833**	**708,299**
Per Capita Annual Community Emissions	**8.465**	**7.984**	**8.067**	**8.012**

2.2.3 City government operations and airport emissions

Past and present greenhouse gas emissions inventories of City government operations

Since 2005, the City has calculated annual inventories of greenhouse gas emissions associated with City government operations, including buildings, facilities, and vehicles.

With staff efforts throughout City departments since that time, carbon emissions from City government operations have been substantially reduced. By 2008, emissions from City operations were 14.5% lower than 1990 levels, surpassing the Kyoto Protocol target identified in the 2005 Mayor's Agreement (reduction of emissions to 7% below 1990 levels by 2012). Further reductions are anticipated in coming years.

Figure 2-3 Past & Present City Government Operations Carbon Emissions

Year	CO_2 Emissions (metric tons CO_2e)
1990 (estimate)	13,145
2005	11,766
2006	11,784
2007	12,750
2008	11,232
2009	11,412
2010	10,993
2011	10,793
2012 (forecast estimate)	10,679
2013 (forecast estimate)	9,856
2014 (forecast estimate)	9,794

Figure 2-4 2010 City Government Operations Carbon Emissions

Emissions Sources	Quantity	Units	CO_2 Emissions (metric tons CO_2e)
Natural gas usage	181,208	therms	961.49
Vehicle fleet (gasoline)	202,060	gallons	1,774.08
Vehicle fleet (biodiesel)	59,151	gallons	558.97
Vehicle fleet (CNG)	1,541	GGE	10.57
Harbor patrol (gasoline)	4,413	gallons	38.75
Harbor patrol (diesel)	470	gallons	4.80
Total Direct Emissions			***3,348.66***
Electricity usage	23,275,165	kWh	7.644.86
Total Indirect Emissions			***7,644.86***
Total (Direct & Indirect)			**10,993.52**

Santa Barbara Airport emissions

Aircraft emissions estimates are presented here for information purposes and not included as part of the communitywide inventory for the City Climate Plan, due to federal preemption of local control over aircraft emissions. This is consistent with guidance on preparing community carbon emission inventories from the California Air Resources Board (CARB) and the California Air Pollution Control Officers Association (CAPCOA), as well as the Bay Area Air Quality Management District (BAAQMD).

The Santa Barbara Airport conducted an emissions inventory and projections using a base year of 2005, which was last updated in 2008. Calculations below for emissions from airport vehicle, Auxiliary Power Units/ Ground Support Equipment (APU/GSE) and aircraft landing and takeoff (LTO) cycles are from the inventory and were then scaled to 1990, 2007, and 2010 flight data from the FAA's Air Traffic Activity Data System (ATADS). Forecasts were then developed for the years 2020 and 2030, assuming a constant per capita aircraft usage from the 2010 year.

Figure 2-5 Aircraft Operations at Santa Barbara Airport: Estimated Carbon Emissions
(Annual Metric Tons CO_2e)

	1990	2005	2007	2010	2020	2030
Aircraft Landing Takeoff Cycle	9,493	7745	6,036	5329	5,549	5,733
Auxiliary Power Units/ Ground Support Equipment	313	255	199	176	183	189
Motor Vehicles	150	198	154	136	142	146
Total Emissions	**9,956**	**8,198**	**6,389**	**5,641**	**5,874**	**6,068**
Per Capita Emissions	**0.116**	**0.091**	**0.072**	**0.064**	**0.064**	**0.064**

2.2.4 *Without Plan* forecasted future community carbon emissions for 2020 and 2030 ("business as usual" + State legislative reductions)

Forecasts of future citywide emissions are first calculated from the 2007 baseline inventory without adding in reductions from the Climate Plan measures. The forecasts reflect future carbon-generating activities by residents, businesses, and institutional uses (e.g., oil and gas combustion for electricity and vehicle fuels) continuing at current trends.

Incremental City development and population growth under General Plan Update policies is assumed and the General Plan traffic model is used to project future vehicle trip generation. The forecasts account for State legislative measures in place that would reduce future carbon emissions generation statewide, including in Santa Barbara (e.g., Pavley auto emissions standards, cap-and-trade stationary source regulations, energy portfolio targets).

Carbon emissions forecasts for 2020 and 2030 without implementation of climate plan measures (business as usual with State legislative reductions scenarios) are provided below in Figure 2.4. Emissions forecasts showing reductions with implementation of the climate plan strategies are provided in Section 2.4 - Effectiveness of Strategies.

Trends

The forecasted *Without Plan* community emissions for the years 2020 and 2030 show continuing reduction in overall Santa Barbara emissions citywide, and reductions in on-road vehicle emissions, electricity and natural gas consumption emissions, and landfill gas emissions, with off-road vehicle/equipment emissions leveling off. These trends reflect emission-reducing measures already undertaken or in place.

The 2020 *Without Plan* forecast with State legislative reductions shows overall citywide annual emissions continuing to meet the 2020 target of 1990 levels. The 2020 and 2030 *Without Plan* per capita vehicle emissions forecasts also meet the regional 2020 and 2030 targets for not exceeding 2005 levels.

Figure 2-6 *Without Plan* Forecasted Future Citywide Carbon Emissions 2020 and 2030 (Annual Metric Tons CO_2e)				
	2020 Business as Usual	**2020 BAU+State Actions**	**2030 Business as Usual**	**2030 BAU+State Actions**
Population	92,064	92,064	95,110	95,110
***Scope 1** (direct emissions within City)*				
On-Road Vehicle Emissions				
Internal City Trips	182,594	130,773	188,922	116,759
Commute Trips	99,682	71,392	107,555	66,447
Other Non-Internal Trips	266,912	191,161	324,081	194,039
Subtotal – On-Road Vehicle Emissions	*549,188*	*393,326*	*620,628*	*377,245*
Per Capita On-Road Vehicle Emissions	*5.965/person*	*4.272/person*	*6.525/person*	*3.966/person*
Off-Road Vehicle/Equipment Emissions				
Construction	29,217	29,217	30,183	30,183
Industrial/Commercial Equipment	7,432	7,432	7,678	7,678
Lawn & Garden	1,473	1,473	1,522	1,522
Miscellaneous Equipment	3,087	3,087	3,189	3,189
Subtotal Off-Road Vehicle/Equipment Emissions	*41,209*	*41,209*	*42,572*	*42,572*
Per Capita Off-Road Vehicle/Equipment Emissions	*0.448/person*	*0.448/person*	*0.448/person*	*0.448/person*
Natural Gas Consumption				
Residential	75,408	74,800	78,011	76,703
Commercial	45,757	45,182	47,221	46,489
Industrial	786	643	1,077	986
Subtotal – Natural Gas Consumption Emissions	*121,951*	*120,625*	*126,309*	*124,178*
Per Capita Natural Gas Consumption Emissions	*1.325/person*	*1.310/person*	*1.328/person*	*1.306/person*
Landfill Decomposition				
Subtotal - Las Positas Landfill Decomposition	*4,592*	*3,045*	*2,785*	*1,847*
Per Capita Las Positas Landfill Decomposition	*0.050/person*	*0.033/person*	*0.029/person*	*0.019/person*
Subtotal – Scope 1 Emissions	***716,940***	***558,205***	***792,294***	***545,842***
Per Capita – Scope 1 Emissions	***7.787/person***	***6.063/person***	***8.330/person***	***5.739/person***
***Scope 2** (indirect emissions outside City, from City electricity and water consumption)*				
Electricity Consumption in City				
Residential	47,356	39,918	49,248	40,411
Commercial	65,524	55,970	68,243	57,661
Industrial/Institutional	23,979	21,946	25,690	23,057
Water Pumping	1,516	1,309	1,566	1,352
Street Lighting	1,217	1,052	1,258	1,086
Subtotal Electricity Consumption Emissions	*139,592*	*118,861*	*146,005*	*122,456*
Per Capita Electricity Consumption Emissions	*1.516/person*	*1.291/person*	*1.535/person*	*1.288/person*
State Water Project Electricity Consumption				
Subtotal SWP Electricity Consumption	*836*	*722*	*836*	*722*
Per Capita SWP Electricity Consumption	*0.009/person*	*0.008/person*	*0.009/person*	*0.008/person*
Subtotal – Scope 2 Emissions	***140,428***	***119,583***	***146,841***	***123,178***
Per Capita – Scope 2 Emissions	***1.525/person***	***1.299/person***	***1.544/person***	***1.295/person***
***Scope 3** (indirect emissions outside City, miscellaneous and lifecycle emissions)*				
Subtotal –-Tajiguas Landfill (waste disposal)	*3,959*	*3,959*	*4,090*	*4,090*
Per Capita – Tajiguas Landfill	*0.043/person*	*0.043/person*	*0.043/person*	*0.043/person*
Subtotal - Scope 3 Emissions	***3,959***	***3,959***	***4,090***	***4,090***
Per Capita – Scope 3 Emissions	***0.043/person***	***0.043/person***	***0.043/person***	***0.043/person***
TOTAL ANNUAL COMMUNITY EMISSIONS	**861,326**	**681,746**	**943,225**	**673,110**
Per Capita Annual Community Emissions	**9.356/person**	**7.405/person**	**9.917/person**	**7.077/person**

2.3 Carbon Emissions Reduction Strategies

This section identifies City efforts already in place that reduce carbon emissions in City government operations and the community at large, and additional future strategies to further reduce carbon emissions in the years ahead.

The strategies are grouped under the headings of energy efficiency and green building; renewable energy; travel fuel reduction and land use; vegetation; waste reduction; and water conservation.

Many of the future strategies have already been adopted as implementation actions in the *Plan Santa Barbara* General Plan Update adopted by City Council in December 2011.

Overall climate goals identified in the City General Plan are provided below and pertinent policies are identified for each topic.

Santa Barbara General Plan Excerpts

OVERALL CLIMATE GOALS AND POLICIES

Sustainability Principles – Environment

Efficiently and effectively managing and protecting our natural and physical resources entails practicing innovative strategies that achieve protection, conservation, enhancement, reduced consumption, reuse, recycling, self-sufficiency, and adaptation to changing climate conditions, should they occur.

Environmental Resources Element – Climate

Goal. Reduce Greenhouse Gases. Reduce where practicable greenhouse gas emissions contributions to climate change, and to air pollution and related health risks.

Policy ER1. Climate Change. As applicable, private development and public facilities and services may be required to incorporate measures to minimize contributions to climate change and to adapt to climate changes anticipated to occur within the life of each project.

Implementation Action ER1.1. Comprehensive Climate Change Action Plan. Prepare a comprehensive climate action plan, toward compliance with AB 32, to address climate change concerns including reducing greenhouse gas absorption, and adaptation to climate change. The climate action plan will include evaluation of community energy use (i.e., energy used by buildings and infrastructure); waste and recycling, water and wastewater systems; transportation; and community design.

Figure 2-7

2.3.1 Energy Efficiency and Green Building Measures

These measures reduce carbon emissions that result from the combustion of fossil fuels for electricity generation, through more efficient electrical devices and conservation practices in existing and new structures.

In addition to addressing climate change, these measures benefit the community by reducing energy operating costs, reducing dependence on foreign oil, conserving limited energy and water resources, and reducing air pollution.

Extensive efforts over the past decade have made City government facilities and operations more energy efficient. Electricity and natural gas consumption has been reduced with more energy-efficient equipment and operational changes to use less energy. Lighting energy demand in City facilities has declined by approximately 50% since 2005. Energy audits of buildings have resulted in an annual savings of $399,000 on operations costs. City actions have also promoted energy efficiency of new development and existing development.

Santa Barbara General Plan Excerpts

ENERGY EFFICIENCY GOALS AND POLICIES

Environmental Resources Element – Energy

Goal. Reduce Fossil Fuel Use. Reduce fossil fuel use through increased efficiency and conservation, and by developing renewable energy sources.

Policy ER3. Decrease City's Global Footprint. In addition to promoting reduced unit size, building footprints and GHG emissions, and energy conservation, promote the use of more sustainable building and landscaping materials and methods.

Policy ER5. Energy Efficiency and Conservation. As part of the City's strategy for addressing climate change, minimizing pollution of air and water, depleting nonrenewable resources and insulating from volatility of fossil fuel prices, dependence on energy derived from fossil fuels shall be reduced through increased efficiency, conservation, and conversion to renewable energy sources when practicable and financially warranted.

Figure 2-8

Community activities

Beyond City government, numerous private actions have been undertaken in the Santa Barbara community to conserve energy. Businesses, institutions, groups, and individuals throughout Santa Barbara have upgraded existing buildings, equipment, and practices to conserve energy and save money. Energy efficiency features have been incorporated in the design and construction of many new structures.

Following are a few examples of such energy-efficiency and green building actions in the Santa Barbara community:

- *Utility upgrade rebates.* In collaboration with the statewide Energy Upgrade California program, Southern California Edison and Southern California Gas Company have instituted incentive and assistance programs for retrofitting to energy-efficient systems. Substantial rebates have been provided for commercial and whole house energy upgrades. Home improvement services have been provided for income-qualified renters and homeowners. Home energy efficiency surveys provide customized recommendations for energy-saving measures from online or mail-in surveys.
- *Built Green.* Built Green is a network of contractors, architects, designers, builders, developers, suppliers, lenders, and real estate agents providing information about green building options that are more cost-effective, healthier, safer, and more protective of the environment. A checklist rating system can guide hundreds of decisions typical in the building process including options for energy-efficient development designs, materials, and processes. The Built Green Resource Center provides information about green building strategies, features, and products.
- *Green Building Alliance* is a group of local architects, civil engineers, general contractors, interior designers, solar contractors, landscape architects, and landscape contractors that practice green building techniques.
- *Shoreline Café* instituted energy management changes, replacing outdoor heaters with a forced air system to reduce natural gas usage by 65%; converting outdoor light fixtures with compact fluorescent bulbs to cut bulb wattage by 80%; and upgrading to energy-efficient kitchen appliances, with an estimated annual energy costs savings of $15,000.
- *Victoria Garden Mews condominium project* in downtown Santa Barbara is an example of energy-efficient green building in new construction (LEED platinum project). The four-unit project provided a 90% reduction of energy use over prior Title 24 standards through passive solar design, high performance windows, extra insulation, and solar water heating. 100% of electricity is produced by an on-site solar photovoltaic system. Water use is cut 40% with efficient plumbing features, rainwater catchments, and on-site retention of run-off. Lumber is from sustainable forests, and low-emitting materials are used (e.g., paints, coatings, carpets).

City activities

The following summarizes City activities already undertaken or in place, and future City strategies toward further energy efficiency and green building in government operations and in the larger community. [See also subsequent sections on transportation, waste management, and water conservation measures, which also reduce energy use.]

Many of the future programs identified are the same or are based on policies recently adopted as part of the City's December 2011 General Plan Update (GPU). Where this is the case, the GPU policy number is noted.

ENERGY EFFICIENCY AND GREEN BUILDING: EXISTING CITY MEASURES IN PLACE

City Government Operations

- ***City energy use and reduction policy*** (City program)
  Guidelines were established for City staff use of lighting, computers, electrical devices, heating, and air conditioning. These include lower lighting levels, temperature guidelines, hibernation of computers, and restrictions on personal electronic devices.

- ***City structure energy audits and energy-efficient equipment*** (City program)
  Energy audits were performed on City facilities where maintenance projects were planned, and energy modifications made. Compact fluorescent and light emitting diode (LED) lighting are used on City buildings. New electrical devices and equipment must be Energy Star or EPEAT certified for low energy use. Modifications included:
  - Installing energy-efficient lighting fixtures
  - Installing occupancy sensors and timer switches
  - Installing lower energy air conditioning systems using fresh air cooling on mild days
  - Installing direct digital controls on heating and air conditioning (HVAC) units
  - Adding sub-meter facilities to monitor and analyze energy use
  - Mechanical retro-commissioning of City facilities
  - Replacing pumps and motors with more efficient, variable speed equipment
  - Consolidating office equipment.

- ***City streetlights and signals*** (City program)
  In 2002, the City's entire system of traffic signals was converted to light-emitting diode LED lighting. All streetlights are now powered by high-pressure sodium or LED lamps.

- ***LEED certified City buildings*** (City program)
  It is City policy that new City-owned buildings achieve at least a silver level of LEED (Leadership in Energy and Environmental Design) certification, which reflects substantial energy efficiency. City efforts in recent years on both new structures and retrofitting existing structures have resulted in LEED certification status for the Community Development/Public Works department offices (platinum status), Airport rental car facility (gold), and fire station headquarters and emergency operations center (gold), as well as for the Granada garage and 914 State Street rest rooms. The new Airport terminal is in place and on-track for receiving LEED gold certification.

- ***City Airport facilities*** (City program)
  The Santa Barbara Airport has numerous measures in place and recent upgrades that reduce greenhouse gas emissions. These include:
  - Ample airfield capacity and short touch-down to take-off times that reduce emissions from idling and planes waiting to take off
  - Centralized location of terminal and fixed-base operators and cross-field taxiway that reduce taxi times

- Centralized terminal and ample parking capacity that reduce vehicle roving
- Bus and taxi services and bicycle access that allow alternative ground transportation; and electric ground service equipment.
- Pilot-controlled lighting that saves energy
- Energy efficient airfield lighting and transformers

Communitywide Measures

- ***Architecture 2030 challenge*** (City program)
  In 2007, Santa Barbara became the first city in the country to adopt the Architecture 2030 Challenge, a nationwide movement for the built environment to become carbon neutral by the year 2030 by reducing building energy use in new construction and major renovations.
- ***City building code energy conservation ordinance for new buildings*** (City program)
  In 2008, the City instituted the most stringent code requirements in the State for energy efficiency of new structures (including residential appliances, heating/cooling systems, swimming pool heaters/pumps). New buildings were required to be at least 10-20 percent more energy efficient than the 2005 building energy efficiency standards, and new residential buildings and additions had to exceed State 2005 Title 24 energy efficiency standards by at least 20 percent. In 2010, the State followed suit with updated statewide CALGreen building code energy requirements, which were incorporated into the City's energy ordinance.
- ***City solar access ordinance*** (City program)
  The ordinance provides standards for protection of solar access in residential buildings and avoidance of significant shadows from adjacent buildings, which assists in passive heating.
- ***South Coast Energy Efficiency Partnership*** (Joint agency program/City participation)
  The partnership is a collaborative effort among the cities of Santa Barbara, Carpinteria, and Goleta, County of Santa Barbara, Southern California Edison Company, and Southern California Gas Company to promote energy efficiency. A Partnership program provided 568 area businesses with free energy-efficient lighting and control systems. A mobile home program provides residents with free energy-efficient products and services, including compact fluorescent light (CFL) bulbs, low-flow showerheads, weatherization, and duct testing. Community events were held to exchange 800 traditional light bulbs for compact fluorescent light (CFL) bulbs, and more than 1,300 incandescent holiday light strands for LED holiday lights, reducing energy use by up to 90% for each replacement.
- ***SB County emPowerSBC financing program*** (County program/City participation)
  In 2010, the City approved participation in the countywide municipal financing program that provides loans with low rates and flexible repayment term to property owners for energy-saving retrofit projects that also improve indoor comfort and lower utility bills. The program is a partner with the statewide Energy Upgrade California program.
- ***Built Green Santa Barbara*** (Private program/City participation)
  The City has worked with Built Green to provide information and classes on green building processes and materials including energy efficiency and passive heating /cooling design.

- ***Green Business Program of Santa Barbara County*** (County program/City participation)
  This program offers incentives and assistance to encourage businesses to take voluntary actions to protect, preserve, and improve the environment beyond what current laws require. Businesses are certified by adopting conservation and pollution prevention measures.

ENERGY EFFICIENCY & GREEN BUILDING: ADDITIONAL FUTURE CITY ACTIONS

City Government Operations

1. ***Energy-efficient City facilities*** (City program; General Plan (GP) policy ER5.2; through 2030)
   Continue implementing programs through the City Sustainable Santa Barbara program for retrofitting of municipal systems with energy efficient equipment, systems, and programs.

   The following equipment upgrades are currently planned to further improve energy efficiency at City buildings: upgrade computer systems to provide automated computer workstation power-off function; replace separate copier, printer, fax, and scanner units with shared multi-function printing units; virtualize 35 remaining servers in primary City Hall and Business Continuity data centers to reduce electrical power and cooling requirements.

2. ***Recreational field lighting efficiency projects*** (City program; target 2015)
   Install energy-efficient lighting projects at Dwight Murphy and Pershing Ball Fields.

Communitywide Measures

3. ***Energy efficient buildings–voluntary actions*** (City program; GP policy ER5.1; through 2030)
   Encourage all new construction to be designed and built consistent with City green programs and policies, the California Green Building Code, and Architecture 2030 goals for energy efficiency in buildings.

   Further reduce energy consumption over time in both new building and through retrofits. Establish a voluntary program and time line for increasing the energy efficiency and carbon neutrality of new buildings or additions, and existing building stock. Provide:

   (a) Information on current energy use and conservation options;
   (b) Incentives for voluntary upgrades;
   (c) Voluntary incremental upgrades may be encouraged at time of sale, and/or other methods for greening the existing building stock; and
   (d) Tools for financing for energy-efficiency upgrades and on-site solar and wind power generation. Continue City work with the County emPower program for financing private energy efficiency and alternative source projects, including assisting with applications, inspections, and outreach education and promotion.
   (e) County Green Business program. Continue City work to check and certify participating local green businesses.

4. Energy efficient buildings–further outreach, incentives, requirements (City program; to 2030)
If there is insufficient progress from the voluntary programs above toward the City's Architecture 2030 building energy efficiency goals, as identified through periodic assessments (using 50% progress by 2020 as a benchmark), institute further actions.

Additional future actions may include the following:

(a) *Community energy efficiency outreach.* Expand outreach programs to promote energy conservation and efficiency in the community, such as the following measures: (1) an energy efficiency challenge campaign for community residents; (2) energy conservation campaigns specifically targeted to residents, businesses, and institutions; (3) further education and assistance with applications and inspections; and (4) an exchange program for high-energy-use items (e.g., halogen torchiere lamps).

(b) *Incentives and funding assistance.* Expand financial incentive measures, such as: (1) a low-income weatherization assistance program; and (2) other energy efficiency upgrade assistance targeted to residential, business, and institutional sectors.

(c) *Reach code energy efficiency ordinance*. Implement City municipal code amendment to require energy efficiency levels for new development and redevelopment beyond California Green Building Code standards.

(d) *Lighting standards*. Establish additional standards for energy efficiency of outdoor lighting in the City lighting ordinance, which may include measures to provide for full cut-off light fixtures at parking lots and on buildings where safety standards are met; provide photocells or astronomical time switches on all permanently installed exterior lighting; and provide exterior and security lights with motion detectors.

(e) *Upgrades at time of sale*. Adopt ordinance provisions to establish requirements for energy efficiency upgrades at the time of property sale to increase the efficiency of existing building stock.

5. Green building (City program; GP policies ER3; ER3.1; ongoing to 2030)
In addition to promoting reduced unit size, building footprints, and GHG emissions, and energy conservation, promote the use of more sustainable building and landscaping materials and methods. Establish additional green building incentives for the use of locally harvested, renewable building or manufacturing materials.

2.3.2 Renewable Energy Measures

Renewable energy means power sources that will not be depleted, such as solar, wind, geothermal, hydroelectric, biomass, methane, and wave energy, as well as alternative non-petroleum fuels such as bio-gas, and energy storage devices such as fuel cells. Use of renewable energy sources reduces carbon emissions that result from combustion of fossil fuels for electricity and vehicles powered with petroleum fuels.

California law (AB 1007) requires that by the year 2020, at least one-third of the State's energy is to come from renewable sources. This objective is occurring at a time when electricity demands are expected to continue rising, even with conservation measures, but look to be met with less fossil fuels and more renewable energy sources.

Renewable energy use also benefits the community by reducing energy operating costs, reducing dependence on foreign oil, conserving limited energy resources, and reducing air pollution.

Santa Barbara General Plan Excerpts

RENEWABLE ENERGY GOALS AND POLICIES

Environmental Resources Element – Energy

Goal. Reduce Fossil Fuel Use. Reduce fossil fuel use through increased efficiency and conservation, and by developing renewable energy sources.

Policy ER6. Local and Regional Renewable Energy Resources. Provide both within the city, and regionally through working with the County and other local jurisdictions or parties, opportunities to preserve, promote and participate in the development of local renewable energy resources such as solar, wind, geothermal, wave, hydro, methane and waste conversion.

Figure 2-9

Community activities

Numerous renewable energy activities have occurred in the Santa Barbara community by private individuals, businesses, institutions, and interest groups. Here are a few examples:

- *Solar photovoltaic panel installations*. There are at least 426 solar photovoltaic panel systems of various sizes installed within Santa Barbara, put in by individual residents, businesses, and institutions, and an additional 140 solar installations in process. Projects of particular note:

  Westmont College. Photovoltaic panels were installed on forty faculty homes on the campus, generating more than 157,000 kilowatt-hours of energy annually to fully power the neighborhood and reduce carbon dioxide generation by 3,000 tons.

  City College. More than 1,300 solar panels installed in the West Campus parking lot collect a combined 130 kilowatts of energy, about 30% of the West Campus energy needs.

- *Community Environmental Council (CEC) Blueprint and Fossil Free by '33 Program*. In 2007, the non-profit organization CEC produced *A New Energy Direction: A Blueprint for Santa Barbara County*, which provides energy information and strategies toward the goal of becoming fossil free by 2033, including through renewable energy sources such as solar, wind, and ocean, and alternative travel modes, fuels, and vehicle technologies.
- *Solarize Santa Barbara solar price incentive program.* A group purchase discount program was instituted by the Community Environmental Council which helped 49 families on the South Coast install solar facilities generating a combined total of 205 kilowatts of power.
- *Earth Day festival.* Since 1970, the annual Santa Barbara Earth Day Festival has been hosted by the Community Environmental Council with cooperation of dozens of sponsors and hundreds of exhibitors. Now attracting approximately 35,000 people, the festival provides public information about sustainable products and practices, including renewable energy.
- *County of Santa Barbara courthouse geothermal project:* Installation of a subsurface geothermal system to heat and cool the Records office.
- *Marborg Industries.* A local waste management services business, Marborg had their corporate office certified through the County Green Business program, and has engaged with Energy Star and LEED (Leadership in Energy and Environmental Design) programs for building upgrades. Actions included installing a 30 kW photovoltaic system that generates 13% of their daily energy consumption; use of compressed natural gas (CNG) trash collection trucks; and use of biodiesel (B5) fuel.

City programs

Following are descriptions of existing City programs and identified future strategies for furthering renewable energy use in City government facilities and Santa Barbara community.

RENEWABLE ENERGY: EXISTING CITY MEASURES IN PLACE

City Government Operations

The City has increased its use of renewable energy in City facility operations as a percentage of total energy consumed from 16% in 2004 to about 25% in 2010 with actions such as those listed below.

- ***Solar installations*** (City program)
  Since 2007, the City has installed the following solar energy systems at City facilities:

  -Solar voltaic system (330 kW) at the Public Works corporate yard, which produces 520,000 kWh/year (equivalent to the electricity supply for 1,040 homes)

  -Photovoltaic solar panel array (15 kW) at Fire Station 2 supplying half its electricity needs

  -Solar thermal systems to heat water at five harbor marina restrooms, cutting natural gas consumption by approximately 30%.

- ***Wastewater treatment plant energy*** (City program)
  A twin fuel cell system converting methane to electricity powered approximately half of the plant's needs with a 500-kilowatt capacity. This first commercially operated fuel cell in the State and the renewable energy system won the League of California Cities Helen Purnam Grand Prize award. The system is being replaced in 2012 with reciprocating engine co-generation and power purchase agreement.
- ***Grease-to-gas injection project at treatment plant*** (City program; target 2013)

  The project at the El Estero wastewater treatment plan diverts fats, oil, and grease (FOG) into the El Estero digesters. This reduces truck trips currently required to haul the material long distances for disposal, and generates an increased amount of methane that can be used for co-generation of heat and electricity, reducing up to 17 metric tons of carbon dioxide equivalent emissions annually.

Citywide Measures

- ***Housing Authority solar projects*** (City program)

  The Housing Authority of the City of Santa Barbara received federal grant money to install photovoltaic panels on two affordable senior housing complexes (Vista La Cumbre on south La Cumbre Lane, and Presidio Springs on Laguna Street) as well as on a Laguna Street maintenance facility, for a combined system of 100-kilowatts of power.
- ***Solar design guidelines*** (City program)

  In 2006, the City adopted solar design guidelines and a recognition program to encourage photovoltaic systems that are high performing as well as integrated with building design. Passive solar guidelines also encourage building siting, orientation, materials, construction techniques, and landscaping to reduce long-term energy needs. The City's annual solar design recognition program has awarded recognition to dozens of exemplary solar installations throughout the City.

RENEWABLE ENERGY: ADDITIONAL FUTURE CITY ACTIONS

City Government Operations

6. ***Hydroelectric plant recommissioning*** (City program; target 2013)
   Recommissioning the City's small hydroelectric plant will result in the production of clean and renewable hydroelectric power. It is estimated that the plant will initially produce 1600 megawatt hours (MWh) of power annually, and due to siltation at Gibraltar Dam, will gradually reduce to a steady state production of 975 MWh, equivalent to the energy demand of approximately 200 single-family homes.
7. ***Solar photovoltaic project at Airport long-term parking lot*** (City program; target 2015)
   Project for installation of 500 kw photovoltaic panels on canopies over portions of the Airport long-term parking would utilize a power purchase agreement (PPA) for City purchase of energy.

Communitywide Measures

8. ***Community choice aggregation*** (City program; GP policy ER6.1; target 2020-2030)
   Conduct a feasibility study to include a cost-benefit analysis and carbon footprint assessment for a Community Choice Aggregation arrangement as either a bulk purchaser or producer of energy from alternative resources.

9. ***Alternative/advanced fuels*** (City program; GP policy ER6.2; target 2020)
   Support and implement the California Energy Commission and State Air Resources Board goal for alternative/advanced fuels set forth in AB 1007, for non-petroleum fuel use of 20% by 2020 and 30% by 2030.

10. ***Incentives for alternative fuel infrastructure*** (City program; GP policy ER6.3; target 2015)
    Give priority through expedited processing to projects providing infrastructure for alternative/advanced fuels.

11. ***Small wind generators*** (City program; GP policy ER6.4; target 2020)
    Identify and study regulatory obstacles to installing small individual or community wind generators, and prepare standards for siting, design, maintenance, and operation to ensure compatibility with adjoining land uses and protect environmental resources.

12. ***Facilitate renewable energy technologies*** (City program; GP policy ER6.5; target 2020)
    Promote flexible design review standards and facilitate use of renewable energy technologies through streamlined planning and development rules, codes, processing, and other incentives.

13. ***Solar energy*** (City program; GP policy ER6.6; target 2015)
    Encourage the use of solar photovoltaic arrays on new construction, redevelopment, and significant remodel projects, as appropriate, taking into consideration project scale and budget, building size, orientation, roof type, and current energy use.

    (a) For multi-residential projects of three (3) or more units, require provision of a minimum two (2) kilowatts (kW) system per unit consistent with the City's Solar Energy System Design Guidelines, if physically feasible.

    (b) For 1- or 2-unit residential projects, require provision of 300 square feet rectangular unobstructed roof area free of mechanical equipment and vents facing south, east, or west in a manner that future photovoltaic installation would be consistent with the City's Solar Energy System Design Guidelines, if physically feasible.

    (c) For commercial and industrial projects, provide a minimum of five (5) kW of photovoltaic panel systems for every new square foot of building net floor area; or a photovoltaic system sized to meet a minimum of 30% of the average projected energy demand for the structure, whichever is lower.

2.3.3 Travel and Land Use Measures

Travel and land use measures aim to reduce carbon emissions from the combustion of petroleum-based vehicle fuels. Use of alternatives to petroleum-based fuels and single-occupancy vehicles reduces the number of petroleum-powered vehicle trips overall and per capita vehicle miles travelled.

Other important activities are industry efforts to develop lower emission vehicle and fuel technologies, as well as State and Federal regulatory measures and research funding assistance.

Examples of local methods to reduce vehicle trips and associated emissions include telecommuting, alternate work hours, ride sharing, and car sharing; use of alternate fuels and vehicle technologies (e.g., bio-fuels, hybrid and electric vehicles); and enhancing the convenience of using alternatives to driving alone, such as more pedestrian and bicycle connections and more frequent bus service. Land use measures include designations and incentives to establish more affordable housing close to employment and local services.

A related City objective is to maintain and enhance livable neighborhoods that are walkable and have a variety of commercial, employment, and recreational destinations within daily walking, bicycling, and transit distance of residences, especially in the Downtown core of the City. Methods include neighborhood planning to improve connectivity and land use mix; retrofitting transportation infrastructure; and mobility policies for designing new development.

Santa Barbara General Plan Excerpts
CIRCULATION AND LAND USE GOALS AND POLICIES

Circulation Element

Goal and Vision. While sustaining or increasing economic vitality and quality of life, Santa Barbara should be a city in which alternative forms of transportation and mobility are so available and so attractive that use of an automobile is a choice, not a necessity.

Land Use Element

Goal. Mobility: Apply land use planning tools and strategies that support the City's mobility goals.

Housing Element

Goal. Regional Cooperation and Jobs/Housing Balance. Coordinate City efforts with those of surrounding communities towards balancing jobs and housing in the regional housing market.

Figure 2-10

Beyond climate protection, measures to reduce single-vehicle trips and petroleum-based fuel use have benefits to individuals and communities in reduced vehicle traffic congestion and air pollution, fuel and overall transportation cost savings, reduced dependence on foreign oil, benefits to public health and health care costs from more exercise, and greater sustainability and livability of neighborhoods.

Community activities

There are many examples of private transportation and land use activities by individuals, businesses, institutions, and organizations in the Santa Barbara community that help reduce vehicle trips and associated emissions. Here are some examples:

- *Bicycle commuting*. Commuting by bicycle in Santa Barbara and on the South Coast is estimated to have increased from 3% to 5% in the last decade. An estimated 14,000 persons bike to the University of California, Santa Barbara campus each day, including City residents.
- *Hybrid and electric vehicles*. The number of Santa Barbara residents and employees that drive hybrid vehicles has grown over the past decade, and the area is expected to be one of the top markets for plug-in electric vehicles.
- *Cottage Hospital*. A private non-profit institution and large employer, Cottage Hospital has instituted a variety of incentives to reduce employee single-vehicle commute trips, including a parking cash-out program, bicycle parking, and employee shower facilities. Development of the Hospital's *Bella Riviera Workforce Homes* (115 new town houses) is underway. Seventy percent of the homes are to be sold to Cottage Hospital employees at affordable prices, creating the potential for substantial reduction of long-distance employee commute trips and emissions. The project also incorporates green building measures.
- *Santa Barbara Bicycle Coalition*. This volunteer organization runs Bici Centro, a do-it-yourself bicycle repair shop and skills education center in Santa Barbara, and promotes safe bicycling throughout Santa Barbara County.
- *COAST (Coalition for Sustainable Transportation)*. COAST is a group of individuals active in community groups, businesses, and agencies that advocate for enhanced transportation options and integrated land use and transportation policies on the South Coast.
- *Mesa Architects neighborhood planning*. A group of architects is developing ideas for improving community, self-sufficiency, and sustainability of the Mesa neighborhood through connectivity improvements for vehicle, bicycles, and pedestrian walks and trails, and plans for commercial, institutional, and open space uses.

City activities

Following are descriptions of existing City programs and identified future transportation and land use strategies for reducing petroleum-powered travel trips in City government operations and in the Santa Barbara community.

TRAVEL & LAND USE: EXISTING CITY MEASURES IN PLACE

City Government Operations

- ***Fleet vehicles*** (City programs)
  The City has reduced carbon emissions of City vehicle operations by the following actions:

  Alternative vehicle fuels and technology. With gradual replacement of vehicles, the City now maintains a fleet with 36% of vehicles using alternative fuels or vehicles using advancements in technology to gain fuel efficiency. This includes 102 vehicles running on B20 biodiesel, 41 hybrid vehicles, five (5) electric vehicles, eight (8) compressed natural gas (CNG) vehicles, two (2) liquid petroleum vehicles, and 19 vehicles capable of using ethanol.

  Fleet pool and operations efficiency. The City implemented a vehicle pool car program that encourages vehicle sharing among departments. Employee driver training has been conducted to improve fuel-efficient driving and lower vehicle maintenance and repair costs. Fleet practices resulted in a 5% reduction in fuel use for City operations in 2009-2010. Conversion to use of rerefined oil when possible for all maintenance needs reduced annual oil consumption of virgin petroleum by approximately 1800 gallons.

- ***City employee travel changes*** (City programs)
  Reduction of vehicle trips by City employees both for commuting and work has reduced carbon emissions from government operations through the following actions:

  Fewer drive-alone commutes. Drive-alone commutes by City employees were reduced by 542,000 miles in 2009-2010 through a work trip reduction incentive program of commuter benefits and bus pass programs. Employees also increased use of alternative modes when traveling to other City facilities in the performance of their work, by switching to carpooling, walking, and bicycling, and transit.

  Alternate work schedules. Eighty-one percent of City employees work schedules that shift timing of commute travel away from the peak commute times before 8:00 a.m. and after 5:00 p.m., which lessens peak-hour congestion and associated fuel use and emissions.

  Other travel reductions: A limited telecommuting program has been instituted for some City functions, which reduces home-work commute trips. With recent budget considerations and improvements in telecommunications options, air travel has also been limited.

- **Electric vehicle charging stations** (City/joint organization program)
  Eight plug-in electric vehicle charging stations have been installed at City parking facilities.

Communitywide Measures

- ***Downtown redevelopment & mixed use policies*** (City program)
  The City has adopted a series of mixed-use (commercial-residential) land use and circulation policies over the past several decades (e.g., variable density ordinance and commercial growth limit) that have successfully encouraged redevelopment of aging existing structures and emphasized mixed-use projects in the Downtown commercial zones. These measures have assisted in the growth of alternative travel modes and in managing vehicle traffic flow.

- ***Bicycle facilities*** (City program)
  The Bicycle Master Plan was adopted by the City in 1998 with goals to improve bikeway linkages between areas. Many miles of bike lanes, as well bicycle parking and other facilities have been established in the last twenty years.

- ***Pedestrian facilities*** (City program)
  The City adopted a Pedestrian Master Plan in 2006 with goals and programs to increase linkages between areas and among modes of travel. More than five miles of sidewalks and other improvements have been completed in the past twenty years. The Safe Routes to School program has focused on filling in pedestrian links used by schoolchildren. The 2008 citywide traffic analysis completed for the *Plan Santa Barbara* General Plan Program Environmental Impact Report found a high level of pedestrian facilities in place and high level of walking within the community.

- ***Bus facilities and service*** (City program)
  The City has contributed financially to the Metropolitan Transit District, which has supported service level and facility improvements. Shuttle bus services have also been established in areas such as the waterfront.

- ***Parking policies*** (City program)
  City downtown parking programs over the past decades have supported commercial enterprise, traffic flow, and neighborhoods.

- ***Area mobility plans*** (City program)
  City planning processes have taken place to address traffic and mobility issues in the Upper State Street area (2007), St. Francis neighborhood, and Oak Park neighborhood.

- ***Freeway improvements*** (City/Joint agencies programs)
  Improvements instituted to Highway 101 and freeway ramps over the past decades have improved traffic flow and peak-hour traffic levels.

- ***Roadway improvements*** (City and joint agency programs)
  The City has undertaken strategic roadway improvements to improve connectivity and traffic flow. Reduced street widths and fewer vehicle lanes have been incorporated to support non-vehicle modes when feasible, and with assurance of continued safety.

- ***Electric Vehicle Infrastructure*** (Joint agency program)
  The City participates in the Central Coast Plug In Electric Vehicle Readiness Plan for establishing a network of charging stations to facilitate electric vehicle travel.

TRAVEL & LAND USE: ADDITIONAL FUTURE CITY ACTIONS

City Government Operations

14. ***Fleet vehicles*** (City programs; ongoing through 2030)
Continue gradual transition of City fleet to use more alternative technologies and fuels that lower carbon emissions. Continue to expand fleet operations efficiency measures, such as a program for pooling medium and heavy-duty City trucks.

15. ***City employee travel changes*** (City programs; ongoing through 2030)
Continue and expand programs to reduce City employee travel emissions, including through alternate work hours and telecommuting; and reduced commute and work-related vehicle trips through vehicle sharing, walking, bicycling, and transit.

Communitywide Measures

16. ***Mixed use land use policies*** (2011 General Plan policies; ongoing though 2030)
Implement new policies for smaller unit and density incentives to further encourage a mix of commercial and residential land uses, particularly in the City Downtown, and to encourage workforce and affordable housing close to transit and commercial services.

17. ***Sustainable neighborhood plans – travel and land use***. (City GP LG15.1; ongoing to 2030)
Develop sustainable neighborhood plans that would enhance livability and accessibility, and reduce the community's carbon footprint. The plans would include measures to address land use, circulation, and infrastructure issues, such as housing types and affordability; neighborhood-serving commercial and institutional uses; community services; transit, vehicle, bicycle, and pedestrian connectivity; open space, street tree, and landscaping improvements; and parking policies.

18. ***Experimental development techniques*** (City program; target 2015; ongoing through 2030)
Establish permitting process and development standard flexibility on a limited basis to allow new development techniques and materials that could provide reduced carbon emissions. Examples may include green roofs and straw bale construction.

19. ***Complementary land uses*** (City program; target 2020; ongoing through 2030)
As part of in-fill mixed-use development Downtown and the preparation of Sustainable Neighborhood Plans, establish provisions to facilitate complementary new uses not present (e.g., supermarkets, parks, schools), and allow local-serving businesses near employment centers (e.g., childcare, restaurants, banks, medical offices, drug stores).

20. ***Electric vehicle charging stations*** (City program; target 2015; ongoing through 2030)
Work with the business community and community interest groups to facilitate installation of a network of additional electric vehicle charging stations for improved all electric vehicle travel locally and regionally.

    a) Install additional universal electric vehicle charging stations in City-owned parking facilities.

b) Continue to collaborate regionally to implement the Central Coast Plug In Electric Vehicle Readiness Plan, including efforts to identify regional charging station sites, coordinate with institutions, businesses, and other entities with large EV charging programs, obtain grant funding assistance, and support public education and outreach.

c) Establish guidelines and procedures to expedite permitting and installations of charging stations, including provisions addressing locations, equipment types, siting and station designs, installation standards, signage, fees, inspections, utility notification, and site lay-outs for multi-family and mixed-use properties. Consider including example applications and designs, on-line and phone inspection options, and plan waivers.

d) Consider ordinance provisions for new projects that require pre-wiring exceeding CalGreen standards to avoid the need for voltage/wiring upgrades with later installation of charging stations.

e) Consider designating zones and land uses appropriate for quick charging facilities (higher energy, larger stations) and slow charging facilities (lower energy, smaller stations).

f) Consider zone changes to require specified percentages of required parking spaces by land use type to have electric vehicle charging equipment.

21. ***Pedestrian infrastructure*** (City program; GP policy C1.1; plan update 2020; ongoing to 2030)
Continue to implement additional pedestrian facility improvements, such as sidewalk in-fills and safe routes to schools; universal access with corner curb ramps; Pedestrian Master Plan measures for crossing designs and pedestrian amenities (e.g., lighting, benches, trees, shelters, newspaper dispensers, landscaping).

22. ***Bicycle infrastructure improvements*** (City program; C1.1; plan update 2015; ongoing 2030)
Continue to implement additional Bicycle Master Plan measures (e.g., bicycle facilities on streets and public places, policies for bicyclists on major routes during peak travel periods, and funding for bike lane maintenance) and safe routes to school improvements; and coordinate with South Coast agencies to expand regional routes and paths.

23. ***Personal transportation*** (Joint City/ private program; GP policy C1.2; ongoing to 2030)
Work with business and community interest groups to establish community car sharing and bicycle sharing programs.

24. ***Intermodal connections*** (City program; GP policy C1.3; ongoing to 2030)
Continue to improve intermodal route connections and infrastructure for vehicles, public transit (buses, shuttles, rail, and taxis), car pools, carshare/bikeshare programs, bicycles, and pedestrian routes.

25. ***Optimize roadway capacity, flow and safety*** (City program; GP C1.4; ongoing to 2030)
Continue to use Intelligent Transportation System (ITS) techniques such as signal timing to optimize capacity and improve flow and safety for vehicles, pedestrians, bicycles, and buses.

26. ***Mid-block traffic Improvement and connectivity techniques*** (City program; C1.5; to 2030)
As part of capital improvements and private development, continue to implement measures to improve mid-block traffic flow, connectivity, and alternative travel mode access, such as shared driveway access and parking; effective access design and driveway spacing; median treatment; traffic control refinement; and design of improvements for buses, pedestrians, and bicycles.

27. ***Regional transportation and commuter transit*** (City/joint agencies; GP policy C2; to 2030)
Continue to coordinate regionally with SBCAG, MTD, railroads, cities, counties, Caltrans, and other agencies and the private sector to improve rail, bus, and carpool options for commuters and improve energy efficiency of transportation network in conjunction with SB 375 Sustainable Communities planning. Include efforts to improve inter-county multi-model and rail and express bus commuting, and to improve bus service headways during peak periods to five minutes on primary transit corridors. Study and pursue all feasible funding mechanisms to improve transit service.

28. ***Vehicle speeds*** (City program; GP policy C3; target 2015)
Advocate for legislation to promote speed limits that consider street design, adjacent land uses, and mix of travel modes used.

29. ***Bus pull-out right of way*** (City program; GP policy C4; target 2015)
Advocate legislation to facilitate buses in turn-out pockets merging back into traffic.

30. ***Circulation improvements*** (City program; GP policy C6; ongoing through 2030)
Identify intersection deficiencies, feasible improvements and funding, and install improvements.

31. ***Transit passes*** (City/joint agency program; GP policy C6.3; ongoing to 2030)
Establish program to require employer-paid transit passes for new development and employers, and work with regional partners to include regional bus and rail services, and provide compatible fare media.

32. ***Parking policies*** (City program; GP policies C6.4, C6.5, C7; ongoing to 2030)
Continue to refine parking policies to support traffic management and vehicle trip emissions reduction, including expansion of programs as supported by the community to provide an employer parking cash-out program; on-street parking pricing; changes to parking requirements for development such as parking maximums and unbundled parking; changes to downtown parking district; shared parking policies; and changes to residential parking programs.

33. ***Car-pooling and telecommuting*** (Joint public/private program; GP policy C6.7; to 2030)
Continue to work with public and private interests and regional partners to promote opportunities for increased carpooling and telecommuting.

34. ***Car-sharing*** (Joint public/private program; GP policy C6.8; ongoing to 2030)
Continue to work with public and private interests and regional partners to support establishment of car-sharing programs and facilities.

35. ***Development impact fees*** (City program; GP EF26, C1.1; target 2015)
Conduct a feasibility study toward establishing development fees to help fund circulation improvements. Consider a fee scale based on project locations, extent of mixed-use development, and extent of green space loss.

36. ***Street widths*** (City program; ongoing through 2030)
Continue to implement measures in appropriate locations to reduce street widths or vehicle lanes, while maintaining adequate emergency access, in order to manage traffic and safety and accommodate complete street improvements for pedestrian and bicycle travel.

37. ***New development vehicle emissions*** (City program; GP Policy ER1.2; target 2015)
Require new development, redevelopment and substantial remodels to demonstrate how the project will support the City in attaining regional GHG vehicular emissions reduction targets. The Santa Barbara region has targets of zero net increase (from 2005 levels) in per capita GHG vehicular emissions in 2020 and 2035. These regional targets were adopted in 2010 by the Santa Barbara County Association of Governments (SBCAG) and the California Air Resources Board (CARB) pursuant to SB 375.

38. ***Marine shipping emissions*** (City program; GP Policy ER9; ongoing through 2030).
Support regional and State efforts to reduce marine shipping emissions.

2.3.4 Vegetation Measures

Trees are an important factor in climate change because they remove carbon emissions from the atmosphere by photosynthesis or growth (known as carbon sequestration), as well as provide cooling shade.

The City of Santa Barbara is largely built out but includes large park areas (e.g., Parma Park, Elings Park, and Douglas Family Preserve), creek corridors, and an extensive "urban forest" of trees and vegetation within the built community. The City's urban forest includes more than 45,000 trees along public streets and in parks and other public places, and an estimated 250,000 trees on private property. There is a long history of City policies and programs to protect and maintain trees, open space, and vegetation.

The benefit of vegetation-related measures in absorbing carbon emissions is a complicated matter however. In addition to absorbing CO_2, plants also emit some CO_2 through respiration. Soils also release CO_2 emissions through decomposition of organic matter. The net amount of CO_2 intake versus CO_2 release varies for different types of vegetation and ecosystems. In general, long-lived vegetation, especially trees, provides the greatest benefit to CO_2 uptake because they lock up carbon in their wood. Annual plants provide little benefit to carbon sequestration because the CO_2 they absorb is released the same year when they die.

Some landscape maintenance practices may promote CO_2 releases as well as other greenhouse gases such as methane or nitrous oxide, such as activities involving disturbance and erosion of soils, some fertilizer and irrigation practices, and handling of trimmings and yard waste. Use of powered lawn and garden equipment also contributes to carbon emissions. As such, landscape management practices need to consider both CO_2 uptake and potential gas releases to achieve a balance of greenhouse gas reduction. As an example, in areas using reclaimed water, which is higher in nitrogen, less nitrogen fertilizer is needed for the plants, and to avoid high nitrous oxide releases. Protection of established older trees may generally provide more climate benefit than replacement with new tree plantings.

Santa Barbara General Plan Excerpts

VEGETATION GOALS AND POLICIES

Conservation Element

Visual Resources Goal. Maintain the scenic character of the City by preventing unnecessary removal of significant trees and encouraging cultivation of new trees.

Visual Resources Policy 4.0. Trees enhance the general appearance of the City's landscape and should be preserved and protected. 4.1 Mature trees should be integrated into project design rather than removed.4.2. All feasible options should be exhausted prior to the removal of trees. 4.3 Major trees removed as a result of development or other property improvement shall be replaced by specimen trees on a minimum one-for-one basis. 4.4. Private efforts to increase the number of street trees throughout the City should be encouraged.

Biological Resources Goal. Enhance and preserve the City's critical ecological resources in order to provide a high-quality environment necessary to sustain the City's ecosystem.

Policy 4.0. Remaining Southern Oak Woodlands shall be preserved, where feasible.

Figure 2-11

The urban heat island effect refers to higher overall temperatures in urbanized areas than rural areas because materials such as concrete and asphalt, particularly with darker colors, absorb more heat than vegetation. This effect may be counteracted to some extent by using light or reflective materials in building (e.g. "cool roofs") and paving, and increasing use of permeable and vegetated surfaces rather than paving. Green roofs (i.e. vegetated) also have benefits to climate protection from storm water detention (less water treatment and energy use) and providing a thermal insulation layer (less energy for heating and cooling).

Trees and vegetation have other benefits beyond climate change, including air and water cleansing; habitat and food chain support; watershed and erosion protection; open area and visual aesthetics to balance with urban built areas; mental and physical health and quality of life; recreation; education and scientific/medical research; and the intrinsic value of flora.

Community activities

There have been many activities over time within the Santa Barbara community by private organizations, individuals, businesses, and institutions to provide and preserve trees and vegetation. Examples include:

- *Santa Barbara Beautiful*. This community organization finances the planting of street trees in Santa Barbara from private donations and fundraising. By planting 300 or more trees each year, their efforts have totaled more than 12,000 street trees planted since 1997. Their cooperative efforts with the City Parks and Recreation Department have resulted in the City of Santa Barbara earning the National Arbor Day Foundation designation of Tree City USA for more than 31 consecutive years.
- *Private property trees and landscaping*. Tree and landscape installation and maintenance by private citizens and businesses throughout Santa Barbara is a primary component of the City's urban forest.
- *Community funding organizations*. Community organizations such as Fund for Santa Barbara, Santa Barbara Foundation, Trust for Public Lands, Pearl Chase Society, and others have funded projects for tree, habitat, and landscape preservation and restoration.

City activities

Following are descriptions of existing City programs and identified future strategies for reducing carbon emissions in City government operations and in the Santa Barbara community through preservation and addition of trees and other vegetation.

VEGETATION: EXISTING CITY ACTIONS IN PLACE

Communitywide Measures

- ***Parks, landscape, and tree maintenance*** (City program)
  The City provides maintenance for more than 50 park and open space areas covering more than 1,500 acres, as well as more than 45,000 street trees.
- ***Tree replacement program***. The City loses an average of 150 trees per year. Parks Department policy is to continue tree replacement by planting a minimum of 150 trees annually to replace those lost.
- ***City street tree master plan and outreach program*** (City program)
  In the past five years, the City has completed a comprehensive inventory of City street and park trees, and expanded community education and outreach programs.
- ***City tree preservation policies and landscape guidelines*** (City program)
  The City has adopted General Plan Conservation Element policies, ordinance provisions, design review guidelines, and permitting requirements for tree preservation and landscape maintenance that protect specified trees and landscaping from removal or excessive pruning. The provisions apply to trees in front yards and public rights-of-way including parkways along roads; historic and specimen trees; trees and vegetation in hillside areas and on steep slopes, within 50 feet of creeks, near coastal bluffs, or involving native biological habitats; trees and vegetation in historic or design districts or on historic properties; and landscaping approved as part of a plan or condition of approval for a new development.
- ***Creeks restoration*** (City program)
  Over the last decade, the City has undertaken numerous creek restoration projects that help to preserve creekside trees, vegetation, and open spaces. Project examples include Bohnett Park/Old Mission Creek; Arroyo Burro Estuary/Mission Creek; Upper Las Positas Creek; and Lower Mission Creek Restoration; and replanting efforts at Sycamore Creek/Cacique, Mission Creek/Vernon Road, San Roque Creek/Stevens Park, Sycamore Creek/Liberty Street.

VEGETATION: ADDITIONAL FUTURE CITY ACTIONS

Communitywide Measures

39. Tree planting (City program; target 2030)
Increase carbon sequestration through the planting of additional trees, with a goal of 1,000 new trees by 2030.

40. Street trees (City program; target plan update 2015; ongoing through 2030)
Update the Street Tree Master Plan to establish and implement measures addressing management and community objectives for long-term tree preservation and maintenance, and effectively allocate resources. Issues to be addressed would include canopy cover, land uses, infrastructure constraints, environmental resources, and aesthetics.

41. Tree and landscaping protection (City program; GP policies ER11-11.3; target 2015, ongoing)
Protect and maintain native and other urban trees and landscaped spaces, and promote the use of native or Mediterranean, drought-tolerant species in landscaping to save energy and water, incorporate habitat, and provide shade.

(a) Update ordinance provisions to protect native oaks and other native or exotic trees. New development shall be sited and designed to preserve existing mature healthy native and non-native trees to the maximum extent feasible.

(b) Site new development outside of oak woodlands to the maximum extent feasible. Within and adjacent to oak woodlands:

- Avoid removal of specimen oak trees;
- Preserve and protect oak saplings and native understory vegetation within areas planned to remain in open space;
- Provide landscaping compatible with continuation/enhancement of the habitat area, consisting primarily of native species and excluding use of invasive non-native species;
- Include conditions of approval for habitat restoration of degraded oak woodlands where such development creates direct or indirect impacts to the affected habitat;
- Minimize or avoid installation of high water use landscaping under the drip lines of oak trees.

(c) Create a citywide enforcement and mitigation program for removal, severe pruning without a permit, or neglect, of protected trees (street trees, trees in front yards, and historic or otherwise designated trees).

42. Urban heat island effect (City program; GP policy ER1.3; target 2020)
Reduce the urban heat island effect by establishing standards to decrease impermeable surfaces and building areas relative to lot size; providing incentives such as expedited permitting for building projects that incorporate cool roofs and green roofs; and coordinating with the Fire Department and Transportation Division to establish any appropriate changes to roadway standards to allow more permeable surfaces.

43. Regional open space preservation (City/joint agency program; GPU OP2.3; ongoing to 2030)
Coordinate with the County of Santa Barbara, School District, and recreational service providers of the cities of Goleta and Carpinteria on regional open space protection in the Las Positas Valley, foothills, and other areas determined appropriate.

2.3.5 Waste Reduction Measures

Methane is generated from landfills and wastewater treatment plants when wastes decay. A very potent greenhouse gas (about ten times stronger than carbon dioxide), methane accounts for about one percent of California's total greenhouse gas emissions. Methane capture for energy use or flaring can reduce these emissions.

Disposal of manufactured products as solid waste reflects the loss of the intrinsic energy value of products due to multiple phases of manufacturing, including raw materials extraction and processing, and product manufacturing and transport. Further energy use and emissions are then required to manufacture replacement products. Diverting materials from waste disposal through reuse, recycling, and composting reduces the energy use and emissions associated with product manufacturing and transport.

California legislation in 1989 (Assembly Bill 939 - Integrated Waste Management Act) required that all cities and counties divert 50% of solid waste generated annually from landfill disposal by the year 2000 through source reduction, recycling, and composting. The city of Santa Barbara community met that State objective through a variety of reuse and recycling programs. Subsequent State legislation Senate Bill 1016 (2007) establishes an objective for further reduction of per capita waste diversion rates. Additional progress will be needed on the diversion rate of trash collected at the curbside within the city of Santa Barbara, which now averages about 40%.

These measures also benefit the community by extending the life of landfills and potentially reducing and deferring the high cost of establishing additional disposal facility capacity and associated increases to collection fees; and by conserving energy resources and reducing dependence on foreign oil.

Community activities

Actions by private community members, organizations, and businesses have been the key to substantial progress in reducing and diverting waste in Santa Barbara. Here are a few examples:

- *Marborg recycling facility*. Establishment of the Marborg facility within the City has provided greatly increased local recycling capacity. City contracting for waste hauling and recycling pick-up has provided for increased recycling.
- *Reuse and recycled materials stores*: Establishment of local stores such as the Habitat for Humanity store and Living Green have provided access to used construction materials for re-use and materials made from recycled materials.

Santa Barbara General Plan Excerpts
WASTE REDUCTION POLICY

Safety and Public Services Element – Waste Reduction

Policy PS8. Solid Waste Management Programs. Continue and expand City recycling programs for resource reduction, reuse, and recycling of solid waste.

Figure 2-12

City activities

Following are descriptions of existing City programs and identified future waste management strategies for reducing carbon emissions in City government operations and the community.

WASTE REDUCTION: EXISTING CITY MEASURES IN PLACE

City Government Operations

- ***City solid waste program*** (City Program; City Solid Waste Strategic Plan)
  Instituted numerous changes to City government operations to reduce waste and divert waste from landfill disposal, including: installed more than 600 standard small trash and large recycling containers; policies for reduced printing, increased use electronic documents, and double-sided printing; policies for purchase of recycled paper and other products; composting operations; zero waste meetings and events. Currently there is an estimated 20% diversion rate overall by all City facilities, with one-fifth of City facilities at 66% diversion or better.
- ***City facilities mixed use recycling*** (City program)
  Comprehensive recycling programs established at ten City facilities.

  Airline terminal waste management (City program; Airline Terminal Solid Waste Plan)
  Educational outreach and training on solid waste program was provided to terminal tenants to minimize solid waste generation.
- ***Former Las Positas landfill*** (City program)
  Flare established for methane at Elings Park.

Communitywide Measures

- ***Regional waste diversion*** (Multi-Jurisdictional Solid Waste Task Group; City Strategic Plan)
  City implementation of identified regional programs to expand diversion of waste from landfill disposal through commercial recycling, electronic waste collection, household hazardous waste collection, food waste collection and processing, and construction/demolition waste recycling. Coordination on initial steps toward establishment of a regional resource recovery facility as an alternative to landfill disposal.
- ***Community solid waste program*** (City program; City Solid Waste Strategic Plan)
  Installed more than 500 recycling containers on city sidewalks and in parks; public outreach includes service announcements and *Looking Good Santa Barbara* program that bestows service awards on community members that reduce waste.
- ***Business recycling program*** (City program)
  Provided lower collection rate incentive for business recycling and composting.
- ***Construction/demolition waste*** (City program; City Strategic Plan)
  Established City ordinance requiring recycling of construction/demolition debris.

- ***Foodscraps composting program*** (City program)
  Instituted program for 155 businesses, including Santa Barbara and Hope School Districts, Santa Barbara City College, Cottage Hospital, hotels, and restaurants.

- ***Single-use bag reduction*** (City/business/interest group joint program)
  Undertook a public educational outreach and voluntary program to encourage use of reusable bags when making purchases, together with Santa Barbara Channelkeeper, Choose to Reuse, California Grocery Association, Tri-County Produce, and grocery stores.

WASTE REDUCTION: ADDITIONAL FUTURE CITY ACTIONS

City Government Operations

44. City business purchasing guidelines (City program; GP Policy PS8.5; target 2015)
Amend City procurement guidelines to increase use of goods made from re-used materials in City government operations.

45. City facilities recycling (City program; target 2015)
Establish additional comprehensive recycling programs at City facilities with the target of reaching overall City operations waste diversion rate of 50% by 2015 and 60% by 2020.

46. Electronic processes (City program; target 2014)
Increase City processes done electronically to reduce printing. These will include more use of scanning and email technology to reduce printing of legal documents; and coordinating an electronic campaign filing system for candidates, committees, and elected officials.

47. City coordination with region (City program; through 2020)
Continue coordination with Santa Barbara County and other cities in solid waste planning.

Methane Reduction

48. Waste-to-energy facility at landfill (County/City program; GP Policy PS8.4; target 2015)
Continue to partner with the County of Santa Barbara and other participating South Coast agencies in establishing a waste-to-energy conversion technology facility at Tajiguas Landfill.

Communitywide Reduced Waste Disposal and Increased Recycling

49. Communitywide waste diversion goal (City program; target 2020)
Achieve 75% overall waste diversion from landfill disposal by 2020 through waste reduction, reuse, recycling, and composting.

50. Regional material recovery facility (County/City program; City Strategic Plan; target 2015)
Continue pursuing the establishment and operation of regional MR facility on South Coast.

51. Waste audit information for businesses (City programs; GP Policy PS8.5; target 2015)
Continue conducting commercial business waste audits with the Green Business Program.

52. Recycling education campaigns (City program; GP Policy PS8.5; target 2015)
Continue to develop recycling outreach education and incentive programs to highlight the economic and environmental benefits of recycling.

53. Single-use materials and packaging reduction (City program; GP Policy PS8.5; target 2015)
Consider City ordinance options to discourage single-use materials and reduce packaging.

54. Business and multi-family sector recycling ordinance (City program; GP Policy PS8.5; 2015)
Develop a City ordinance requiring recycling in the business and multi-family residential sectors to achieve compliance with AB 341 legislation.

55. Construction waste hauling program enforcement (City program; GP Policy PS8.5; 2015)
Increase monitoring and enforcement of City Unscheduled Hauling Ordinance to ensure that most construction debris is recycled.

56. Increased recyclables sorting (City program; GP Policy PS8.5; target 2015)
Pursue increased waste diversion capture through increased sorting, via waste management contracts or the regional resource recovery facility project.

57. School waste diversion (City/District program; target 2015)
Continue City program with district schools to establish mixed recyclables and food scrap collection programs at Santa Barbara high schools and junior high schools.

58. Materials reuse & recycling information for builders (City program; GP PS8.2; target 2015)
Establish data/outreach to connect builders to outlets for salvage/recycled building materials.

59. Building space guidelines for waste management (City program; GP Policy PS8.3; 2015)
Revise the City's Space Enclosure Guidelines for new building to provide additional space for recycling, green waste, and food scrap collection.

60. Additional recycling materials (City program; GP Policy PS8.5; target 2020)
Pursue measures to add more materials to recycling and organics diversion (e.g., textiles, wood, and film plastics).

61. Additional greenwaste capacity (City program; target 2020)
Undertake measures to increase local greenwaste capacity.

62. Additional recycling in public places (City program; target 2020)
Install additional recycling containers in public parks and streets.

63. Additional composting (City program; target 2020)
Coordinate with public and private entities to increase composting.

64. Single-use bag reduction (City program; target 2015)
Participate in regional environmental analysis with BEACON (Beach Erosion Authority for Clean Oceans and Nourishment) and other South Coast agencies, and implement an ordinance to regulate the distribution of single-use bags by retailers in the City.

2.3.6 Water Conservation Measures

Water supply facilities utilize energy for water transport and processing. The State Water Project is the largest single user of electricity in California, particularly because of large energy requirements for pumping water over mountains. Local water processes involve relatively less intensive energy use, but cumulatively it is substantial.

Water conservation measures are associated with electricity savings and resulting carbon emissions reductions. It is anticipated that plumbing upgrades and appliance standards will provide substantial reduction in water demand by both existing and new development in the coming decades.

In addition to benefits for climate protection, water conservation benefits the community with lower costs and more options for supplying water needs, lowered energy use, and less dependence on foreign oil.

Santa Barbara General Plan Excerpts
WATER CONSERVATION POLICIES

Goal. Present and Future Service Needs. Ensure that public infrastructure and services are planned, sited, upgraded, and maintained to meet present and future service needs efficiently, economically and in a manner consistent with a sustainable community and climate change.

Policy PS5. Analysis of Water Savings. As part of the Long Term Water Supply Program update, perform a comprehensive analysis of water savings from specific conservation measures, including a cost benefit analysis, to determine which potential new water conservation measures will be most feasible and cost effective for the City to pursue. The City shall incorporate identified measures into the water conservation component of the LTWSP update. *[Note: This measure was completed in 2011 with the LTWSP update.]*

Policy PS6. Water Conservation Program. The use of water conservation practices shall be both encouraged and required, as appropriate, for all development projects.

Figure 2-13

Community activities

There have been many efforts to conserve water use and reduce associated energy use by individuals, businesses, and institutions in Santa Barbara over the past several decades through measures such as installation of water-conserving plumbing and irrigation equipment; use of drought-tolerant landscaping; and reduced water use practices. Here are a few examples:

- *Water-conserving public demonstration gardens.* Gardens with examples of low-water use plantings, irrigation, and composting systems, along with public outreach and education, have been established by a number of institutions in Santa Barbara, including Santa Barbara City College and the Santa Barbara Botanic Gardens.
- *Utility upgrade programs.* Southern California Edison and Southern California Gas Company have instituted energy conservation rebate and assistance programs that include upgrades for high-efficiency clothes washers and low-flow showerheads that also conserve water.

- *Allen Associates residential development*. Dennis Allen was named the City of Santa Barbara's first Water Hero for his Victoria Garden Mews project of four condominium units. The project incorporates both indoor and outdoor water-efficient features. High-efficiency appliances are used (washing machines, faucets, toilets). The courtyard garden of fruit trees, vegetables, and drought-tolerant and native plants is irrigated with rainwater directed into filtrated roof gutters and to basement storage. The front lawn is UC Verde Buffalograss, a species that uses 70% less water than traditional lawns and requires little mowing, and the lawn is irrigated with a subsurface drip system.
- *City College plumbing upgrades*. City College replaced more than 100 toilets with high-efficiency, water-conserving models (1.28 gallons/flush).

Even with a gradual increase in population and employees, the city of Santa Barbara community has reduced its overall water use by more than 2,000 acre-feet per year (AFY) in the last two-decade period since an extended drought occurred in the late 1980's and early 1990's.

City activities

The following summarizes City activities already undertaken or in place, and future City strategies toward further water conservation in government operations and the community.

WATER CONSERVATION: EXISTING CITY MEASURES IN PLACE

City Government Operations

- ***Water conserving equipment and practices*** (City program)
  The City has retrofitted City facilities with water-conserving equipment such as high-efficiency toilets, waterless urinals, and low-flow showerheads, as well as water wise landscaping. Irrigation systems at City facilities and parks continue to upgrade with more efficient equipment, smart irrigation controllers, and rain sensors. Water-conserving practices have also been put into place for City facilities and landscape maintenance activities (including Water Conservation Requirements for New Construction and Renovations at City Facilities). Recycled water is used at City parks and the golf course for irrigation and toilet flushing.
- ***Water loss control*** (City program)
  The City audits water balance annually; the City water systems unaccounted loss is less than 10%. Water main conditions are tracked and replacement needs prioritized. The City replaces about three miles per year of the 275 mile system of water mains.
- ***California irrigation management information system (CIMIS)*** (City/State program)
  CIMIS is a network of weather stations that read and collect information on wind, vapor pressure, air temperature, relative humidity, dew point, solar radiation, soil temperature, and precipitation. The information is transmitted to a central computer data base that gives daily evapotranspiration rates that can be accessed on DWR's website to assist in efficient irrigation practices. Two CIMIS weather stations are owned by the California Department of Water Resources (DWR) and located at the City Golf Course and Vic Trace Reservoir. City staff assists in maintenance of the stations.

Communitywide Measures

- ***City water conservation plans and policies*** (City programs)
  City water management plans, policies, and programs have long reflected a commitment to water conservation along with the management of diversified water supply sources. The current Long-Term Water Supply Plan (2011) sets a water conservation policy for the period to the year 2030 as follows: *"The City will operate a water conservation program aimed at minimizing the use of potable water supplies, meeting the requirements of the California Urban Water Conservation Council Best Management Practices, and achieving compliance with 20 x 2020 per capita water use limitations."* [Note: 20 x 2020 refers to the State legislative objective of reducing per capita water use by 20% by 2020.]

- ***Santa Barbara County integrated regional water management program*** (Joint agencies)
  The IRWMP is a coordinated effort of the Santa Barbara County Water Agency together with cities including the City of Santa Barbara, special districts, and water companies within the County to promote and practice integrated regional water management strategies toward sustainable water use, reliable water sources, water quality, environmental stewardship, efficient development, protection of agriculture, and watershed awareness. Priorities identified in the proposed 2012 Plan update include measures to increase conservation and efficiency of water use.

- ***Ordinance provisions for water conservation, landscaping, recycled water*** (City program)
  City ordinance provisions are in place to provide for water-conserving plumbing standards; required findings for water supply and conservation for new development permits; compliance with adopted landscape design standards for water conservation; water use conservation regulations during declared drought conditions; and required use of recycled water for irrigation when available..

- ***Rain shut-off sensors*** (City program)
  This City program provides free rain shut-off sensors that stop a sprinkler timer from watering during and after a rain event. A sensor reduces winter water use and water bills by an estimated average of 16%.

- ***Landscape rebate program*** (City program)
  Provides rebates for installation of water-efficient irrigation equipment, water wise plants, mulch, smart irrigation controllers, and laundry-to-landscape gray water systems (up to $1,000 for residential, $4,000 for commercial or homeowners associations).

- ***Water evaluations*** (City program)
  Provides residential, business, and irrigation water use evaluations and recommendations for improved efficiency measures and upgrades.

- ***Water-wise landscape guidance*** (City programs and joint-agency programs)
  Internet information programs have been established including water-wise plants appropriate for the local climate, and a landscape water budget program. The Landscape Watering Calculator tool helps estimate the right amount of water to give a landscape and identifies a weekly irrigation schedule based on location, plant types, soil type, and sprinkler type. The

Watering Index provides settings for irrigation controllers to adjust weekly water schedules based on seasonal weather changes. A Green Gardener program (sponsored by City, County, other cities and water districts) has trained more than one thousand certified green gardeners in Santa Barbara County.

- ***Grey water and rainwater collection guidelines*** (City program)
  Reuse of wastewater from showers and clothes washers for landscape irrigation is permitted under California Plumbing code provisions, and the City provides educational information, a permitting guide, and design examples. Information is also provided about rainwater harvesting and use of rain barrels.

- ***Public information*** (City programs and joint agency programs)
  City public education and outreach programs include a water conservation hotline for questions and scheduling water check-ups; a City water conservation website (www.SaveWaterSB.org); promotion of the regional water conservation website (www.sbwater.org) and free Water Wise Gardening in Santa Barbara County compact disc; water conservation brochures and handouts on indoor water conservation, efficient irrigation, and sustainable landscaping; videos on water conservation, sustainable landscaping, and efficient irrigation available for loan to the public; and an annual media campaign in conjunction with the Santa Barbara County Water Agency and water purveyors.

- ***School education*** (City programs)
  Water education programs are given in approximately 90 class and summer camps per year. Water education materials are provided to schools and tours of City water treatment facilities with free bus service are provided. The City participates in the Annual Water Awareness high school video contest and Santa Barbara County Science Fair with a special award on water awareness.

WATER CONSERVATION: ADDITIONAL FUTURE CITY ACTIONS

City Government Operations

65. **City facilities** (City program; ongoing through 2030)
Continue implementing City policies for water-conserving equipment upgrades and practices at City government facilities. Implement additional facility, landscape, and procedure improvements to further conserve water as identified and determined feasible.

Communitywide Measures

66. **Community water conservation** (City program; LTWSP and GP PS6.1; ongoing through 2030)
Continue and expand City water conservation measures as identified in the City Long Term Water Supply Plan (2011), including services to water customers, public information and education, landscape design standards, building standards, and regional coordination. The year 2020 water use reduction target for the Santa Barbara community is to reduce 20% per capita water use from the prior baseline level of 154 gallons per capita per day (GPCD) to 117

GPCD in 2020. The 2009 level for the City was 130 GPCD. Actions to further encourage or require water conservation may include the following:

(a) *Marketing plan*. Continue and expand efforts, such as establishment of water wise landscape and homeowner association recognition programs; enhance outreach materials including dual-language communications materials for gardeners; continue and enhance water wise gardening workshops, gardening tours, and school programs.

(b) *Green building design*. Work with local Green Building associations, City Building Division, developers, designers, vendors to promote incorporating water efficiency into building design.

(c) *Commercial/industrial evaluation and incentives*. Establish program to offer free water survey and evaluation by trained technical professional to 100 highest water user accounts (such as hotels, laundries, etc.). Follow-up communication would be provided on recommended measures for the business to save water and money, and City financial incentives may be offered based on cost/benefit analysis and as City funding sources allow.

(d) *Free mulch*. Establish a City subsidy for delivery charges for mulch obtained free from the local sources. Use of mulch benefits water savings by keeping irrigation or storm water on site and reducing run-off and evaporation.

(e) *Toilet retrofits prior to building sales*. To coincide with California state law Senate Bill 407, establish a program in 2017 (residential) and 2019 (commercial) to work with the real estate industry to require a certificate of compliance be submitted to the City that efficient fixtures are in place or installed at the time of sale prior to close of escrow. Consider allowing this certification to be made as part of the conventional private building inspection report process.

67. Recycled water (City program; LTWSP and GP PS6.2; target 2030)

Per the Long Term Water Supply Program to the year 2030, continue to expand existing City programs for use of recycled water for irrigation at parks, schools, golf courses, and new development near supplies, targeting 300 acre-feet/year (AFY) expansion for a total of 1,100 AFY. Evaluate methods to optimize the feasible use of recycled water in place of potable water. Work towards reducing or eliminating the need for blending potable water with recycled water, based on economic, regulatory, and water supply requirements.

68. On-site water storage and reuse (City program; GP PS6.3; target 2020)

Identify more detailed guidelines for use of cisterns and grey water in new development and for retrofitting existing development.

2.4 Effectiveness of Strategies

Forecasts of carbon emission reductions with implementation of plan strategies are provided below for years 2020 and 2030, followed by a comparison with emission reduction targets.

2.4.1 *With Plan* forecasted emissions reduction in 2020 and 2030

Estimating future carbon emission reductions for the plan strategies entails use of a variety of data, trends, and assumptions, provided in more detail in Appendix B.

The following Figure 2-14 provides a summary of forecasted annual citywide emissions levels with implementation of the climate plan in the target years of 2020 and 2030.

The subsequent Figure 2-15 provides a breakdown of annual emissions reduction for each plan measure in the target years of 2020 and 2030. Some measures are identified as best management practices (BMP) and are expected to provide emissions reduction but no specific reduction level is calculable. Some measures are accounted for through the traffic model used for projecting future vehicle trips and are not identified in the table to avoid double counting.

Figure 2-14 *WITH PLAN* FORECASTED CITYWIDE CARBON EMISSIONS FOR 2020 AND 2030

	2020 With Plan Annual $MTCO_2e$	**2030 With Plan** Annual $MTCO_2e$
Scope 1 Emissions (direct emissions within City)		
On-Road Vehicle Emissions	285,059	175,254
Per Capita On-Road Vehicle Emissions	*3.096/person*	*1.843/person*
Off-Road Vehicle/Equipment Emissions	41,209	42,572
Per Capita Off-Road Vehicle/Equipment Emissions	*0.448/person*	*0.448/person*
Natural Gas Consumption Emissions	117,892	116,531
Per Capita Natural Gas Consumption Emissions	*1.281/person*	*1.225/person*
Las Positas Landfill Decomposition Emissions	3,045	1,847
Per Capita Las Positas Decomposition Emissions	*0.033/person*	*0.019/person*
Subtotal Scope 1 Emissions	**447,205**	**336,204**
Per Capita Scope 1 Emissions	***4.858/person***	***3.535/person***
Scope 2 Emissions (outside City; energy)		
Electricity Consumption in City Emissions	92,972	88,878
Per Capita Electricity Consumption in City Emissions	*1.010/person*	*0.934/person*
State Water Project Electricity Emissions	722	722
Per Capita State Water Project Electricity Emissions	*0.008/person*	*0.008/person*
Subtotal Scope 2 Emissions	**93,694**	**89,600**
Per Capita Scope 2 Emissions	***1.018/person***	***0.942/person***
Scope 3 Emissions (outside City; misc./lifecycle)		
Tajiguas Landfill - **Subtotal Scope 3 Emissions**	**2,305**	**2,399**
Tree Planting (Climate Plan Measure #39)	**-18**	**-35**
Per Capita Scope 3 Emissions	***0.025/person***	***0.025/person***
TOTAL EMISSIONS	**543,185**	**428,167**
Total Per Capita Emissions	***5.900/person***	***4.502/person***

Figure 2-15 Forecasted Citywide Emissions Reductions from Climate Plan Strategies		
Climate Plan Strategies	**Emissions Reduction 2020** Annual $MTCO_2e$	**Emissions Reduction 2030** Annual $MTCO_2e$
ENERGY EFFICIENCY AND GREEN BUILDING MEASURES		
City Government		
1. Energy-efficient City facilities	318	581
2. Recreational field lighting efficiency projects	16	16
Community		
3. Energy-efficient buildings – voluntary actions	3,992	9,816
4. Energy-efficient buildings – further outreach incentives, requirements	334	3,270
5. Green building	BMP	BMP
SUBTOTAL – Energy Efficiency and Green Bldg	**4,660**	**13,683**
RENEWABLE ENERGY MEASURES		
City Government		
6. Hydroelectric plant re-commissioning	233	233
7. Solar photovoltaic project at Airport parking	167	167
Community		
8. Community choice aggregation	20,101	20,101
9. Alternative/advanced fuels 10. Incentives - alternative fuel infrastructure	48,811	85,560
11. Small wind generators	24	60
12. Facilitate renewable energy technologies	167	334
13. Solar energy	996	3,287
SUBTOTAL – Renewable Energy - Electricity	**21,688**	**24,182**
SUBTOTAL – Renewable Energy - Fuel	**48,811**	**85,560**
TRAVEL AND LAND USE MEASURES		
City government		
14. Fleet vehicles	242	484
15. City employee travel changes	200	345
Community		
16. Mixed use land use policies	Addressed in traffic model	Addressed in traffic model
17. Sustainable neighborhood plans	Addressed in traffic model	Addressed in traffic model
18. Experimental development techniques	BMP	BMP
19. Complementary land uses	Addressed in traffic model	Addressed in traffic model
20. Electric vehicle charging stations	1,967	3,018
21. Pedestrian infrastructure	327	584
22. Bicycle infrastructure improvements	905	1,735
23. Personal transportation	2,616	2,919
24. Intermodel connections	1,967	1,886

Figure 2-15 Forecasted Citywide Emissions Reductions from Climate Plan Strategies (continued)		
Climate Plan Strategies	**Emissions Reduction 2020** Annual $MTCO_2e$	**Emissions Reduction 2030** Annual $MTCO_2e$
25. Optimize roadway capacity, flow, and safety	7,867	15,090
26. Mid-block traffic improvement & connectivity	BMP	BMP
27. Regional transportation and commuter transit	4,284	7,974
28. Vehicle speeds	BMP	BMP
29. Bus pull-out right of way	BMP	BMP
30. Circulation improvements	BMP	BMP
31. Transit passes	2,927	5,449
32. Parking policies	31,466	69,973
33. Car-pooling and telecommuting	3,570	4,984
34. Car-sharing	1,118	1,990
35. Development impact fees	BMP	BMP
36. Street widths	BMP	BMP
37. New development vehicle emissions	BMP	BMP
38. Marine shipping emissions	BMP	BMP
SUBTOTAL – Travel and Land Use	**59,456**	**116,431**
VEGETATION AND OPEN SPACE MEASURES		
Community		
39. Tree planting	18	35
40. Street trees	BMP	BMP
41. Tree and landscaping protection	BMP	BMP
42. Urban heat island effect	806	1,612
43. Regional open space preservation	BMP	BMP
SUBTOTAL – Vegetation and Open Space	**824**	**1,647**
WASTE REDUCTION MEASURES		
City government		
44. City business purchasing guidelines	BMP	BMP
45. City facilities recycling	BMP	BMP
46. Electronic processes	BMP	BMP
47. City coordination with region	BMP	BMP
Methane reduction		
48. Waste-to-energy facility at landfill	533	533
Community		
49. Communitywide waste diversion goal	1,121	1,158
50. Regional material recovery facility	BMP	BMP
51. Waste audit information for businesses	BMP	BMP
52. Recycling education campaigns	BMP	BMP
53. Single-use materials and packaging reduction	BMP	BMP
54. Business and multi-family recycling ordinance	BMP	BMP
55. Construction waste hauling enforcement	BMP	BMP
56. Increased recyclables sorting	BMP	BMP

Figure 2-15 Forecasted Citywide Emissions Reductions from Climate Plan Strategies (continued)		
Climate Plan Strategies	**Emissions Reduction 2020** Annual $MTCO_2e$	**Emissions Reduction 2030** Annual $MTCO_2e$
57. School waste diversion	BMP	BMP
58. Materials reuse and recycling info for builders	BMP	BMP
59. Building space guidelines for waste Management	BMP	BMP
60. Additional recycling materials	BMP	BMP
61. Additional green waste capacity	BMP	BMP
62. Additional recycling in public places	BMP	BMP
63. Additional composing	BMP	BMP
64. Single-use bag reduction	BMP	BMP
SUBTOTAL – Waste Reduction	**1,654**	**1,691**
WATER CONSERVATION MEASURES		
City Government		
65. City facilities	1	2
Community		
66. Community water conservation	1,329	1,539
67. Recycled water	BMP	BMP
68. On-site water storage and reuse	138	208
SUBTOTAL – Water Conservation	**1,468**	**1,749**
TOTAL REDUCTION – CLIMATE PLAN MEASURES	**138,561**	**244,943**
Percent Reduction	20%	36%
EMISSIONS AFTER REDUCTION	**543,185**	**428,167**
Forecasted population	92,064	95,110
Per Capita Emissions	**5.90**	**4.50**

2.4.2 Plan comparison to carbon emissions targets

Figure 2-16 below compares forecasted *With Plan* citywide carbon emissions with year 2030 and 2030 targets.

With implementation of Plan strategies, future citywide carbon emissions are forecasted to continue reducing and would surpass the AB 32 total emissions target, at 25% below the 1990 level in 2020. Per capita vehicle emissions are forecasted to surpass the SB 375 target for Santa Barbara County, at 30% below the 2005 level in 2020 and 58% below the 2005 level in 2030.

Figure 2-16 Comparison of *With Plan* emissions forecasts to 2020 and 2030 targets
(metric tons carbon dioxide equivalents MTCo2e)

City of Santa Barbara Emissions Targets	Citywide Emissions Forecasts with Climate Plan Implementation
Total citywide annual emissions (2020 target) 1990 level of total annual citywide carbon emissions, per the State AB 32 target. [1990 level estimated at 724,389 $MTCO_2e$]	With Climate Plan implementation, total annual carbon emissions generated within the City of Santa Barbara community are forecasted to be 543,185 $MTCO_2e$ in 2020, 25% lower than the 2020 reduction target.
Annual per capita vehicle emissions (2020 and 2030 targets) 2005 level of annual per capita carbon emissions from passenger vehicle and light truck travel, per the SB 375 State and regional County target. [estimated at 4.413 $MTCO_2e$/person].	With Climate Plan implementation, citywide per capita annual carbon emissions from passenger vehicles and light trucks are forecasted to be 3.096 $MTCO_2e$/person in 2020 and 1.843 $MTCO_2e$/ person in 2030, 30% lower than the 2020 and 58% lower Than the 2030 target.

3.0 Adaptation to Climate Change

Over time, climate changes are projected to result in some serious effects to public health and safety, the physical environment, and local economies. Even with efforts to reduce the man-made generation of carbon emissions causing accelerated climate changes, high atmospheric carbon levels are already in place causing warming and other climate changes, and are projected to cause substantial changes in weather patterns over the next century.

This section describes the types of climate change effects the city of Santa Barbara community is likely to be vulnerable to in coming decades, and strategies for future adaptation.

3.1 *Climate change effects and Santa Barbara vulnerability*: Addresses the potential for temperature, rainfall, and extreme weather changes, sea level rise, and associated effects on flooding, wildfires, air and water pollution, coastal erosion and inundation, water supply, agriculture and food, energy demand, wildlife habitats, and local economies.

3.2 *Adaptation strategies*: Identifies programs in place and strategies for future climate adaptation pre-planning.

3.1 Climate change effects & Santa Barbara vulnerability

The following discussion describes the types of climate change effects anticipated to occur in the Santa Barbara area over the coming decades. These are expected to include:

- Increased frequency and severity of heat waves, droughts, and wildfires;
- Larger storms and associated flooding and erosion;
- Increased air and water pollution, and changes in pest and vector transmission;
- Sea level rise effects on storm damage, inundation, beach loss, and coastal cliff erosion;
- Changes to water supply, agriculture/food supply, and energy demand;
- Effects on wildlife and habitats; and
- Changes to local economies such as tourism and fisheries.

Climate processes are complex, not completely understood, and not easily forecasted into the future. Modeling efforts to date have been done primarily on global and regional levels. The timing, pace, and extent of climate changes ahead for California and Santa Barbara are uncertain. The timing will likely vary for different types of effects.

However, the 2009 California Climate Adaptation Strategy cites accelerated climate changes already affecting California, including sea level rise, water supply pressures, faster coastal erosion, and increased average temperatures with more extreme hot days. Because greenhouse gases remain in the atmosphere for decades and are already at high levels, climate changes are projected to occur over the coming decades regardless of efforts made to reduce the rate of emissions generation.

Whether substantial effects occur in Santa Barbara and adaptation actions are needed by the year 2030 or within a longer time frame, the City needs to look ahead to monitor climate changes and do additional analysis and planning to identify the best strategies for adaptation and to inform current development decisions. More detailed data for the Santa Barbara area will become available in coming years to assist these efforts.

Sources of data for this discussion include the City of Santa Barbara *Program Environmental Impact Report for the Plan Santa Barbara General Plan Update* (2010); the 2009 California Climate Adaptation Strategy; California's www.Cal-Adapt.org web site; and documents of the Intergovernmental Panel on Climate Change (IPCC), California Air Resources Board (CARB), and Governor's Office of Planning and Research (OPR).

The discussion of sea level rise and effects associated with storm damage, flooding and inundation, and coastal erosion of bluffs and beaches is largely based on a recent study of future vulnerability of the Santa Barbara area (Griggs & Russell, University of California, Santa Cruz, *City of Santa Barbara Sea-Level Rise Vulnerability Study,* California Energy Commission, 2012*)*.

3.1.1 Temperature, rainfall, and extreme weather

Natural global temperature and weather pattern variations have occurred over millions of years with key factors being changes in the earth's orbit, axis tilt and wobble (affecting distance from the sun) and atmospheric heat-trapping CO_2 levels (increased with volcanic eruptions). Physics and chemistry data from arctic ice cores provide atmospheric components going back to ancient times that indicate past weather patterns of cooling and warming involved CO_2 levels gradually ranging between 180 and 280 parts per million (ppm) respectively in cycles of thousands of years. The CO_2 level has now been increased to more than 380 ppm within just a few hundred years and continues to increase rapidly. A pattern of increasing temperatures and more extreme weather events is projected in coming decades.

California's 2009 Climate Change Impacts Assessment (2009 Scenarios Project) identified average projections of climate changes based on six models and two carbon emissions scenarios. The A2 scenario assumes a business-as-usual scenario of continued acceleration of carbon emissions, and the B1 scenario assumes global cooperation to reduce carbon emissions (both scenarios used in Intergovernmental Panel on Climate Change (IPCC) 2009 assessment).

Temperature changes and heat waves

Based on the State assessment, average temperatures within California are projected to increase by $1.82^0 – 5.4^0$ Fahrenheit by 2050. Summer temperature increases are expected to be greater, with more heat waves of longer duration. Coastal regions such as Santa Barbara are expected to experience less warming than inland areas. The State 2009 Scenarios Project forecasts that extreme high and low temperatures will occur much more frequently in many areas of the State.

These changes have the potential to result in public health effects such as more incidences of heat exhaustion and heat stroke, particularly among more vulnerable populations such as the elderly, children, disadvantaged, and those with medical conditions.

Adaptation approaches: Public health programs; additional emergency preparedness planning; development and landscape design incorporating passive cooling and heating.

Precipitation changes

Weather in the State is projected to become generally drier and subject to erratic weather patterns. Models projecting changes in rainfall and snowpack vary as to the amount and location of changes, in part depending on future global carbon emissions levels.

Scripps Institute of Oceanography models project a decrease in precipitation levels in California by 2050 in the range of 12-35%. The State 2009 Scenarios Project expects that more precipitation will fall as rain than snow, affecting the State's water supply (further discussion in section below). More frequent and longer droughts are likely to alternate with infrequent but intense rainstorms.

Wildfires

The Santa Barbara urban interface with the foothills of the Santa Ynez Mountains and Los Padres National Forest is likely to experience gradually increasing wildfire risks in coming decades due to projected climate changes.

Warmer temperatures, drier conditions with lower rainfall averages and more drought periods, periodic high rainfall events causing vegetation growth, and more frequent sun downer wind conditions (down-slope winds typically associated with high temperature and low humidity) all factor into increased wildfire risk.

Adaptation approaches: Emergency preparedness; vegetation management; development policies.

Storm events and flooding

Climate changes such as increased temperature of the ocean can affect extreme storm patterns. The State 2009 Scenarios Project forecasts more erratic patterns including increased frequency and size of extreme rainstorm events in California, and changes in wind patterns.

Flood hazards related to major storm events in the City are largely at the floodplains (along Mission Creek in portions of Downtown, Laguna Channel and Sycamore Creek on the Eastside, and Arroyo Burro Creek in the Upper State Street and Hitchcock Avenue areas and along Modoc Road). The Santa Barbara Airport property is at a low elevation with five creeks and the adjacent Goleta Slough, and most of the area between Los Carneros Road, Hollister Road, and Fairview Avenue has historically flooded during large storm events. At the coast, creeks and smaller storm drains can also develop backwater conditions preventing floodwaters from draining quickly, causing streams to slow or back up with upstream areas flooding.

The frequency and severity of flooding from creeks would be affected by more high-magnitude rainfall events. The depth and velocity of floodwaters could increase, resulting in larger areas subject to flooding. Rising sea levels could combine with these effects to increase storm-related flooding (discussed further below). This poses increased future risk to private property and public infrastructure such as the Harbor, Airport, wastewater, roads, and underground utilities (sewer, electric, and gas lines).

More frequent and severe wildfires could also subject areas downstream from burned watersheds to more rapid runoff from denuded slopes and obstruction of creek channels with debris flows, particularly with a large storm event.

Adaptation approaches: Emergency preparedness; more detailed mapping of vulnerable areas; public facilities programs; and land use policies.

Pests and vectors

Temperature and weather changes could alter transmission and distribution patterns for air- and water-borne pests and vectors and the transmission of diseases, potentially increasing public health risks and effects on agriculture.

Adaptation approaches: Scientific monitoring; vector control and public health programs.

Air pollution

Temperature increases are expected to facilitate smog production, with the potential for adverse effects on public health. Deposition of reactive nitrogen affects agriculture and natural habitats. Changes in weather patterns and associated plant migrations could also alter the timing and duration of pollen production and allergen effects, affecting public respiratory conditions. Increased risk of drought and wildfires could also lead to higher particulate matter levels.

Adaptation approaches: Additional air pollution regulations; public health programs; protective measures to strengthen resiliency of agriculture and habitats.

Water pollution

Climate changes will likely affect pollution levels in streams, groundwater, and the ocean. Water quality in City creeks such as Mission and Arroyo Burro creeks could be affected by lower oxygen content from higher temperatures and nutrient loads, and from greater urban runoff in more intense rainstorms. The risk of seawater intrusion into City coastal aquifers and groundwater basins could increase with large magnitude storms and sea level rise. Storms can also result in pollution from backflow conditions when drainage capacity is increased and wastewater spills. Contaminated groundwater in areas of shallow groundwater, particularly in the waterfront and Estero areas, could be mixed with floodwaters spreading pollution.

The ocean absorbs 30-50 percent of atmospheric CO_2 emissions. Ocean acidification is projected to increase from greater CO_2 concentrations. Carbonic acid is formed from dissolved CO_2, resulting in difficulties for marine creatures to form calcium carbonate shells and skeletons. Species such as crabs, sea urchins, abalones, oysters, mussels, and many plankton species are affected, and their decreased survival also affects birds and fish that feed on them. Acidification also affects fertilization, development, and function of marine species, including kelp, an essential component of West Coast ecosystems and commercially harvested species.

Adaptation approaches: Reduce carbon emissions; monitor and address sources of pollution; prioritize clean-up of groundwater contamination.

3.1.2 Sea level rise

Sea level changes affect temporary storm-related and long-term coastal erosion and retreat, flooding and inundation, and tsunami potential. Sea levels change over time based on changing volumes of seawater and sea basins. Higher temperatures correlate with greater water volumes due to expansion of warmer seawaters and more melting of ice caps and glaciers.

Past and present sea levels

Globally, average sea levels have gradually risen by 350 feet since the last Ice Age ended about 20,000 years ago. Around 1900, the rate of change began to increase, with an average global sea level rise of seven inches over the century. Satellite altimetry indicates an overall increase in average global rates of sea level rise in the last 16 years; however the eastern Pacific rates off the U.S west coast have leveled off and dropped during this period. The reasons for this are not well understood, but it is considered to be a short-term trend.

Along the California coast, 14 National Oceanic and Atmospheric Administration (NOAA) tide gauge stations have measured sea levels over variable periods of 15 to 153 years. Sea levels rose by an average of about eight inches along the California coast in the past century, ranging about 3-8 inches in Southern California. Rates of sea level rise differ by region depending on whether the adjacent land area is gradually subsiding or uplifting. Sea levels are also elevated for months during El Nino storm event periods when the ocean is warmer than usual and there are stronger westerly wind patterns.

The NOAA tide gauge on the Santa Barbara pier within the harbor was initially established in 1973, but has been moved twice due to construction projects, resulting in multiple-year gaps in the record. The gauge has identified an average sea level rise of 1.25 mm/year since 1973 (a rate of about 5 inches per century), but there is a large margin of error (+/- 1.82 mm/yr). However, a study by technical analyst Zervas (2001) identified a faster rate, estimating sea level rise at 3.4 inches for the Santa Barbara City coastline for the period from 1973 to 1999.

Projected future sea level rise

The California Ocean Protection Council (OPC), consisting of representatives of 15 State agencies, has adopted future sea level rise projections for use in State planning and regulatory actions (e.g., Coastal Commission, State Lands Commission, Department of Fish & Game, etc.). State agencies are directed to incorporate sea level rise into planning and decision-making for new construction projects and other coastal activities (e.g., design, assumed life expectancy of structures, permit conditions, etc.). The current sea level rise guidelines adopted for use by State agencies (Figure 3-1) identify averages of 14 inches by 2050 and 47 inches by 2100.

The projections by the OPC Coast and Ocean Climate Action Team (CO-CAT) are based on the Vermeer & Rahmstorf scenarios that relate global sea level rise to global mean surface air temperature increases.

For the year 2030, State projections identify an average increase of seven (7) inches over year 2000 levels, with a range of five to eight (5-8) inches. For 2050, projections are for average sea level rise of 14 inches over year 2000 levels, with a range of 10-17 inches. The year 2100 projections diverge substantially depending on low, medium, or high carbon emission levels, with averages of 40-, 47-, and 55-inch rise respectively.

Figure 3-1. Sea Level Rise Projections Adopted by California Ocean Protection Council

YEAR	AVERAGE OF MODELS (Rise above year 2000 level)	RANGE OF MODELS (Rise above year 2000 level)
2030	7 inches	5 – 8 inches
2050	14 inches	10 – 17 inches
2070		
Low	23 inches	17 – 27 inches
Medium	24 inches	18 – 39 inches
High	27 inches	20 – 32 inches
2100		
Low	40 inches	31 – 50 inches
Medium	47 inches	37 – 60 inches
High	55 inches	43 – 69 inches

Storm damage

Future sea level rise can be expected to exacerbate the severity of high-magnitude storm events that occur when high tides and winter storms coincide, resulting in potentially greater wind, wave, and beach run-up, and greater storm damage to public and private structures as well as accelerated cliff erosion during these events. Storm occurrences during El Nino conditions would be the most severe.

A recent wave height study of the California coast using offshore buoy data (Seymour 2011) indicates an increasing frequency of large wave heights is occurring. Between 1984 and 1995, there were five instances of mean wave heights in southern California (south of Point Conception) exceeding 16 feet for at least 24 hours, while there were 25 such events during 1996-2007.

Past storm events have periodically damaged structures and public facilities along the City waterfront (e.g., Harbor and Leadbetter Beach). The Griggs-Russell vulnerability study assesses that, with projected climate change and sea level rise to the year 2050 (estimated 14 inches), the severity and frequency of such storms will likely increase, and the probability of future storm-related wave damage, flooding, and erosion is high. Historically the magnitude of such damage has been moderate, but can be expected to increase to high by 2050. In the longer-term to 2100 the probability of increased storms and extent of damage could be very high.

Adaptation approaches: Monitoring and further scientific study of likely future local climate patterns; emergency preparedness; planning for future strengthening in place or moving of vulnerable resources, including elevation of infrastructure and structures; and land use policies and standards for future development.

Flooding and inundation

As discussed in the earlier section, increased temporary storm-related flooding potential along City creeks could result due to changes in weather patterns. Elevated sea levels, whether temporary from high tides or storm surges, or from longer-term sea level rise, is expected to increase future storm flooding risks. Sea level rise also increases coastal areas subject to permanent inundation.

Much of the City Waterfront, Downtown, and lower Eastside communities as well as the Santa Barbara Airport are less than ten feet above historic mean sea level. If 100-year floodplains identified on current federal Flood Insurance Rate Maps (FIRM) are projected ahead with seven or 14 inches of sea level rise, a future 100-year flood could flood much of the Waterfront and low-lying City areas and Airport, including private property, public facilities, and subsurface infrastructure.

However, the FIRMs were developed based on topographic maps without precise elevation controls. More accurate base information would provide for better projections. NOAA is collecting new satellite LiDAR imagery and precise elevation data along the California coast which produces a higher resolution topographic map on which to update such projections of areas vulnerable to flood risks.

The Griggs-Russell report, using LiDAR data and average projected 2050 sea level rise (14 inches), identifies that sea level could extend inland by about 35 to 70 feet north of the current high water line, crossing into Shoreline Drive in a few locations along West Beach but not reaching the parking lot or structures west of the Harbor. In the period to 2050, the report rates probability and impact from flooding and inundation as moderate for the City, high for Airport.

Much greater projected sea level rise in the period to the year 2100 (40-55 inches) could cover much of the waterfront area and into low-lying inland areas and the report deems the future impact to be of high probability and magnitude. Public facilities such as the El Estero Waste Water Treatment Plant and coastal roads would become vulnerable. The probability of increased flooding and permanent inundation on the Airport property by 2100 is rated very high.

Adaptation approaches: Additional detailed assessment of future area effects; programs addressing vulnerable resources currently located at water level, e.g., strengthening in place or elevation of infrastructure such as transportation, breakwater, pier, wharf, and buildings; or phased relocation; land use policies and standards for new development.

Beach retreat

Coastal bluffs and beaches are subject to gradual wave-driven erosion, and naturally move landward over time. Projected climate changes, including sea level rise and larger storm events, would accelerate the rate and extent of erosion and retreat. Higher water levels create greater wave energy reaching the shoreline and waves hit higher on cliff faces.

Beach erosion is affected by the width and elevation of a beach, the existence of back barriers that do not allow the beach to retreat, sea level rise, high tides, and large storms. Santa Barbara's three miles of beaches vary in width from about 50 to 175 feet, and experience seasonal changes in sand deposition and erosion. Leadbetter, East, and West Beaches have all temporarily eroded or flooded during large storms (e.g., 1914, 1983). Federal and City dredging and sand management processes are ongoing, as well as efforts by BEACON (Beach Erosion Authority for Clean Oceans and Nourishment), a joint powers authority of the counties and coastal cities of Santa Barbara and Ventura.

Beach erosion at Leadbetter Beach, West Beach, and East Beach is complicated by the Santa Barbara Harbor and coastline to the west. These beaches exist because of the sand trapping nature of the harbor. The rate of sand supply from beaches up the coast should persist with sea level rise since long shore sand transport will continue and the sand is supplied by local streams and bluff erosion. As such, Leadbetter Beach and West Beach can be expected to largely maintain their widths and heights with sea level rise to the year 2050.

The western half of East Beach would likely keep pace with sea level rise, but potentially to a lesser extent because it is within the wave shadow of Santa Barbara harbor. Beach widths in this area could also be controlled by changing the point of discharge for the harbor dredge pipeline. The eastern half of East Beach is more likely to experience substantial beach erosion because it is outside the harbor wave shadow and has a full sandy profile. As sea level rises, the low timber groin in front of the Clark Estate that controls present beach width will become less effective and allow more sand to slip by.

Other beaches along the Santa Barbara and Ventura County coastlines are largely thin veneers of sand over rocky shale terraces, and backed by coastal bluffs, and can be expected to experience substantial beach erosion with sea level rise.

The Griggs-Russell vulnerability study finds a low probability of the permanent loss of City beaches by passive erosion or inundation in the period to 2050 with a projected 14-inch sea level elevation. The probability increases to moderate or high by the year 2100 that all City beaches could be substantially narrowed or lost, affecting beach use, recreation, and tourism.

Adaptation approaches: Monitoring and study of climate changes and specific beach profiles; further study of resource vulnerability; plans for future changes addressing vulnerable resources, such as elevating infrastructure.

Coastal cliff erosion

Miles of actively eroding and retreating sea cliffs 50-150 feet in height front the coast along the Mesa area of the City to Hope Ranch. For the most part, the cliffs are Monterey Shale with unconsolidated marine terrace deposits, tilted toward the beach. The cliffs experience terrestrial erosion, and where close to the ocean, wave erosion at the base of the cliffs. The long-term erosion rates have averaged 6-12 inches/year.

These formations are also prone to landslides and sudden bluff failures. Seawalls and revetments can temporarily slow erosion, but may lead to more erosion at adjacent bluff areas and sand areas below. Bluff top activities such as irrigation can accelerate cliff erosion and susceptibility to bluff failures. Following a large El Nino storm event in 1978, two Mesa home were lost in a landslide. In 2008, a landslide along a portion of Shoreline Park moved the cliff edge back by 38 feet.

Within City limits there are 98 single-family homes along the Mesa cliffs. The homes were constructed at different times and have current setbacks from the cliffs ranging from 35 to 300 feet, and averaging 100 feet. Homes along Cliff Drive, Shoreline Drive, and Camino de la Luz are vulnerable to cliff erosion, as are Shoreline Park, the Douglas Family Preserve, the Clarke Estate, and the Santa Barbara Cemetery.

A bluff retreat model (PWA 2009) that includes the projected increase in wave impacts from sea level rise estimates that long-term retreat rates to the year 2100 in the Mesa and Shoreline Park areas would be much greater than average historic rates.

The Griggs-Russell vulnerability study identifies a moderate probability of significantly increased cliff erosion rates (doubled to 12-24 inches/year) in the period to 2050, with a likely 40-50 foot cliff retreat, which would threaten 30 or more homes and secondary structures. By the year 2100, the report deems the probability and vulnerability high, as this increased retreat rate would threaten 67 bluff-top homes. At potentially even higher retreat rates, nearly all of the oceanfront homes would be affected.

Coastal Act and Local Coastal Plan policies limit new bluff top development and armoring of the coast. City policy requires new habitable development to plan for a 75-year structure life. Development proposals within an area based on a general 12-inch/year retreat rate (per URS Master Environmental Assessment Geology and Geohazards Report, 2009) are required to submit site-specific technical reports used in determining a bluff setback providing for a 75-year structure life.

Adaptation approaches: Additional monitoring and study of vulnerabilities; land use and public safety policies (e.g., periodic update of analytic and setback guidelines for new development on cliff tops).

Tsunami

Tsunamis are ocean waves triggered by earthquakes, landslides, or volcanoes that dramatically increase in size as they reach the shore, which can cause flooding and destruction onshore. Local offshore earthquakes have the greatest potential for generating large tsunamis without warning time. Tsunamis from distant seismic events within the Pacific Ocean can also reach Santa Barbara. Massive tsunamis in the Indian Ocean in 2004 and Japan in 2011 demonstrated the great potential for devastation.

There is no clear direct correlation between climate change and tsunami occurrence or frequency. However, there is potential that tsunami size and damage could increase in the future with sea level rise, because tsunami waves could reach higher elevations and move further inland.

There have been many large earthquakes around the Pacific Rim within the past century, but no record of substantial tsunami damage in Santa Barbara. California Geological Survey records indicate three tsunamis affected Santa Barbara in the nineteenth century: a six-foot 1812 tsunami due to offshore earthquakes; a six-foot 1877 tsunami following a large earthquake in Chile; and an 1896 tsunami with eight-foot waves following a southern California earthquake. Following the 2011 Japan earthquake, a five-foot tidal fluctuation occurred within the Santa Barbara Harbor.

Based on few moderate-size tsunami events in the last 200 years, the Griggs-Russell report considers tsunamis to be of very-low probability of occurrence with a low risk of damage.

Adaptation approaches: Further scientific study, modeling, and mapping of potential risks; additional response planning; and consideration of additional structural provisions.

3.1.3 Public services

Water supply

Statewide weather systems and water systems are complex, and there are many uncertainties in estimating future effects of climate changes on water supply. State studies (Department of Water Resources, 2009 and California Climate Action Team, 2009) identify that future weather changes may likely result in less water storage and water availability in California due to decreased average rainfall, more droughts, less of the precipitation as snow, and earlier melting of snow pack. Warmer weather would also increase demand for irrigation of agriculture and landscaping.

Santa Barbara's water supply has diversified sources, including the Santa Ynez River watershed, State Water Project, groundwater, and recycled water, along with a strong water conservation program. The City also has a decommissioned desalination plant as a back-up supply. Future temperature and weather pattern changes could result in more variable or reduced supplies from the Santa Ynez River watershed and State Water Project, and potentially more saltwater intrusion issues for groundwater.

Studies and planning to address water supply issues, including climate change effects, are ongoing by the State (Department of Water Resources), regional agencies (e.g., Cachuma Operation and Maintenance Board, Santa Barbara County's Integrated Regional Water Management Program), and the City.

Adaptation approaches: Measures to increase water storage capacity and diversify supplies (e.g. water sharing and banking agreements among jurisdictions and sectors; desalination, etc.). The City adopted an updated Long Term Water Supply Plan in 2011 that analyzed future water supply and demand issues to the year 2030, including potential effects of climate change on State Water Project deliveries. The Plan establishes water supply and water conservation management strategies and policies, and concludes that adequate supplies will exist for the City through the planning period of 2030.

Agriculture & food supply

Climate changes in California affecting average temperatures, temperature ranges, rainfall patterns, extreme weather, and water supply can be expected to alter crop yields, growing seasons, and pest ranges. The same is true worldwide, and depending on the rate of climate changes and locations of effects on agriculture, more food shortages could result.

Adaptation approaches: Supporting the protection and adaptation of regional agriculture and local food production and markets.

Energy demand

Temperature increases and more extreme weather events may likely increase future energy demand and use in California, such as for cooling, peak electricity demand (e.g., summer air conditioning), utilities and water transport, and key industries. Although per capita energy use in the State has stabilized in past decades, even with future per capita energy reductions, total statewide energy consumption is expected to increase with population growth.

Future temperature, rainfall, and snowpack changes may also reduce the reliability of hydroelectric power supplies, which currently provide for approximately 16% of Santa Barbara County electricity supplies.

Adaptation approaches: Measures identified in Chapter 2 for energy efficiency, conservation, use of renewable energy sources; statewide utility management of energy provision.

3.1.4 Biological resources

Projected climate changes would have substantial effects on plants and animals. Factors affecting habitats and individual species include rising temperatures, reduced rainfall, variable weather patterns and extreme weather events, wildfire frequency, rising sea levels, coastal erosion, air pollution, creek pollution, ocean acidification, and saltwater intrusion. Climate change is added to existing pressures on natural ecosystems due to urbanization, invasive species, and pollution.

It is expected that various species and habitats would respond in different ways; some species would adapt to changing conditions, some would survive in reduced ranges, some would migrate to areas with suitable conditions, and others would not survive the changes. Species responses are determined by factors such as existing population sizes, tolerance to a range of conditions, genetic diversity and potential to adapt, ability to migrate, response to invasive species, and specialized needs (such as soil types, pollinators).

Specific outcomes cannot be accurately predicted, but researchers expect a general trend of plants and wildlife shifting northward and toward the coast or to higher mountain elevations in response to temperature and rainfall changes. Similar northward movement could occur by marine species. Many habitats would be expected to experience reduced ranges and loss of the biodiversity that strengthens sustainability.

In Santa Barbara, potential future effects on coastal resources include reduction or loss of intertidal habitats, loss or inland movement of wetlands and marshes, and biodiversity loss from gradual coastal bluff, dune, and beach erosion. Upland and foothill species and habitats may experience upslope movement and/or northward migrations. Ocean species and habitats are at risk from temperature and weather changes, and ocean acidification.

Adaptation approaches: Similar to current approaches for conservation of natural areas. These include maintaining contiguous habitats and links between urban area habitats and larger open space areas to aid in migration of species, and restoring degraded habitats to provide flexibility and added range.

3.1.5 Local economies

Fisheries

Increases in ocean temperatures, extreme weather patterns, and pollution have the potential to change the habitable range, distribution, and abundance of marine species, and may include species migration. Marine habitats are complex and many uncertainties exist about how local City fisheries would be affected. Factors affecting the future will include the adaptive capacity of species and changes to the marine food web.

Adaptation approaches: Further scientific study and monitoring, and measures to support sustainable habitats and populations.

Tourism and Recreation

Future heat events may draw more visitors to the coast from inland areas. Climate change effects such as weather events, wildfire frequency, and coastal erosion could also negatively affect tourism and recreation. Future effects are uncertain, but it seems unlikely that they would substantially reduce tourism or recreation in Santa Barbara.

3.2 Adaptation strategies

Existing City of Santa Barbara goals and programs and future strategies are identified for future Santa Barbara planning for adaptation to climate changes anticipated in coming decades.

Community activities

In addition to City programs, there are other programs in place in the Santa Barbara community by organizations, businesses, and agencies that benefit climate adaptation planning, such as the following examples:

- *Emergency response.* The Santa Barbara community has a number of organizations such as the local chapter of the American Red Cross and Direct Relief International with plans and resources to respond in community emergencies. Many businesses, institutions, and neighborhoods also have emergency preparedness plans.
- *Public health services.* Existing programs and services are in place which provide public health protection and public education though hospitals and other private, non-profit, and community medical organizations and facilities, Santa Barbara County programs such as the Health Department and vector control programs, and the Santa Barbara County Air Pollution Control District.
- *Habitat restoration.* Nonprofit community organizations such as the Santa Barbara Foundation, Surfriders Foundation, and Heal the Ocean have funded numerous projects to restore and protect natural habitat areas.
- *Groundwater contamination:* Heal the Ocean is proposing a project with the Regional Water Quality Control Board and Santa Barbara County Fire hazardous materials unit to prioritize contaminated groundwater sites for clean-up.
- *California agency data and guidelines:* The State of California has prepared climate adaptation reports and guidelines, and identified sea level rise assumptions (16 inches) that State agencies are directed to use for State agency planning and development permitting processes.

Santa Barbara General Plan Excerpts

CLIMATE ADAPTATION GOALS

Goal: Climate Change Adaptation. If applicable, incorporate adaptation to climate change in proposals for new development, redevelopment, and public infrastructure.

Goal: Present and Future Service Needs. Ensure that public infrastructure and services are planned, sited, upgraded, and maintained to meet present and future service needs efficiently, economically, and in a manner consistent with a sustainable community and climate change.

Figure 3-2

3.2.1 Existing City programs

The following identifies examples of City of Santa Barbara programs in place that would benefit future planning for climate adaptation.

Emergency preparation programs in place

- ***Emergency plans.*** The City has emergency operations plans that are activated in the event of a natural disaster or other emergency. The City emergency operations center was recently upgraded, and updates to the emergency plan and associated Municipal Code provisions are underway. Inter-jurisdictional assistance agreements are also in place with other local and State agencies.
- ***Hazard mitigation plans.*** In 2011, the City of Santa Barbara together with Santa Barbara County and the other cities adopted updated inter-jurisdictional hazard mitigation plans that identify public safety vulnerabilities in the City and region and measures to address them.
- ***City Wildland Fire Plan and Fire Code.*** The adopted City Wildland Fire Plan and recently updated Fire Code identify wildfire hazard zones and measures to address public safety, including vegetation management, evacuations, and building requirements.
- ***Tsunami plan.*** The City is finalizing a tsunami plan to improve community response readiness, consistent with National Weather Service Tsunami Ready provisions, including methods for public communications and education, installation of signs along the coast, and evacuation routes.

Local plans and programs in place

- ***Long-Term Water Supply Plan.*** In 2011, the City adopted an updated Long-Term Water Supply Plan (LTWSP) that addresses management of diversified sources of City water supply for the coming decades, including consideration of climate change issues. The City also coordinates within the Santa Barbara County region as part of the Integrated Regional Water Management Program (IRWMP).
- ***Creek water quality programs.*** With voter-approved funding, the City has an ongoing program undertaking a wide range of measures to improve creek and ocean water quality and riparian habitats.
- ***Storm Water Management Plan***. The City has an adopted plan identifying measures undertaken during construction and post-construction to reduce storm water and water pollution.
- ***Airport Facilities Plan.*** The current Santa Barbara Airport Facilities Plan is undergoing an updating process, which includes the study of climate issues such as sea level rise.

- ***Harbor Master Plan.*** The City has an adopted Harbor Plan that identifies the City's harbor land use resources, and operates an ongoing waterfront management program.
- ***Safety Element.*** The existing General Plan Safety Element is undergoing an update process that will include discussion of climate change adaptation issues involving wildfires, flooding, and coastal erosion.
- ***Floodplain Management Plans/Ordinance.*** A City floodplain ordinance is in place, periodic local floodplain mapping studies are conducted, and numerous City and County infrastructure improvements have occurred and are planned. Federal (FEMA) floodplain mapping is undergoing an update process.
- ***General Plan Land Use Map.*** Low-density land use designations for High Fire Hazard Areas limit additional residential development in these areas.
- ***BEACON (Beach Erosion Authority for Clean Oceans & Nourishment).*** A joint powers authority of coastal jurisdictions (Counties of Santa Barbara and Ventura, and cities of Santa Barbara, Goleta, Carpinteria, Ventura, Oxnard, and Port Hueneme), BEACON addresses issues of coastal erosion, beach sand nourishment, and clean oceans in the area between Point Conception and Point Mugu.
- ***Coastal development guidelines.*** As part of the Coastal Act and City Safety Element and Local Coastal Program, policies have been in place for coastal development with respect to sea cliff development, including for cliff retreat, slope stability, and development setbacks. Updates have incorporated sea level rise assumptions.

3.2.2 Future planning for adaptation

The following strategies for the period to 2030 identify measures to plan for adaptation of the Santa Barbara community to future climate changes.

Climate change adaptation planning

69. Planning for adaptation (City program; target 2020, 2030, ongoing)

a. *Timeline of climate changes* (General Plan (GP) Policy PS3). The City shall include in the Climate Action Plan an estimated timeline of anticipated potential climate changes over the next 100 years to the extent information is available. This timeline will be periodically updated as part of the Adaptive Management Program and will be considered in all City capital projects. *[See Section 3.1 discussion and Executive Summary time line]*

b. *Monitoring, analysis, and adaptation planning.* Establish ongoing climate change adaptation planning:

- Monitor local climate changes and obtain analysis of local climate effects to support future adaptation planning
- Conduct local vulnerability analysis for future climate change effects
- Identify options and priorities for feasible adaptation planning projects, programs, and updates to land use and safety policies, ordinances, and development standards for hazard areas.

70. Coordination of climate planning efforts (City program; ongoing to 2030)

Continue to coordinate climate-planning efforts as part of existing City operations and resource management programs, and continue to coordinate efforts with other agencies and groups for efficiency:

a. Coordinate among City departments and with other local, regional, State, & Federal jurisdictions, institutions, and community organizations in monitoring, analysis, and adaptation planning and programs.

b. Continue to team with local universities & colleges to evaluate scientific climate information and develop more detailed local Santa Barbara analysis of climate changes and effects

c. Continue to pursue grant funding opportunities to help fund local climate change studies and adaptation programs

d. Establish ongoing mechanisms for providing climate change and adaptation planning information to the public.

Emergency preparedness

71. Emergency response strategies and climate change (GP policy ER2; target 2015)
The City shall incorporate into its response strategies for emergency preparations the potential effects of climate change, including extreme weather, sea level rise, epidemics, and other effects on humans and the built and natural environments.

72. Emergency workforce (GP policy PS11; target 2015, ongoing)
Work cooperatively with other jurisdictions in the South Coast Region to ensure in the event of a disaster, essential workers are available and ready to respond adequately and with timeliness.

73. Public education for emergencies (GP policy PS11.2; target 2015, ongoing).
Promote public education on emergency and disaster preparedness to enhance community resilience.

74. Consider people with disabilities in emergency planning (GP PS12; 2015, ongoing).
Update evacuation plans and other emergency or contingency plans with provisions addressing the special needs and measures required to ensure the safety of people with disabilities.

75. Community resilience planning for emergencies *(Public-private program, target 2020)*
Participate in a community resiliency planning process to help improve both initial local response/relief efforts and later recovery phases of emergencies, as well as for ongoing community self-sufficiency and sustainability.

a. *Plan products.* Develop the following as part of resiliency planning:

- Data base of maps and inventories of relief facilities, resources, businesses, and people that can help provide community relief during emergencies; the means for informing the public of resources data base; and a process for maintaining and updating data base information
- An outline and example for development of neighborhood plans
- An outline of additional community actions or projects for improvement to facilities, equipment, supplies, etc. that would benefit community resiliency (e.g., communications systems improvements)

b. *Plan process.* Conduct the resilience planning process as a broad, cross-sector effort in coordination with the South Coast to engage public and institutional involvement, including:

- Public safety agencies
- Neighborhood groups
- Businesses, non-profit groups, and other non-governmental entities
- Health care facilities and practitioners (e.g., hospital, clinics)

- Relief supplies and volunteers (e.g., Red Cross, DRI)
- Hotels and Institutional facilities (e.g., schools; churches, Fairgrounds)
- Water, wastewater, waste management agencies/companies (including debris removal)
- Local agriculture, groceries, and restaurants
- Energy utilities and companies
- Transportation companies and agencies
- Communications companies
- Animal care facilities; funeral facilities; and other special needs facilities
- Local government departments and special districts (information systems; building & safety; animal control, vector control; etc.)

Wildfire, flooding, and water quality measures

76. Limit residential development in high fire hazard areas (GP policy LG6.5; 2015)
Land use map designations limit residential density in High Fire Hazard Areas. Further limit new residential development in the High Fire Hazard Areas by offering incentives and/or an option for property owners to transfer development rights from the High Fire Hazard Area to the High Density residential land use designations.

77. Fire prevention and creek restoration (GP policy PS13; target 2015)
Coordinate fire prevention and creek protection planning through the development of a set of best practices within and adjacent to creek corridors or other habitat.

78. Water system improvements for firefighting (GP policy PS14; ongoing)
Evaluate the potential for additional water system improvements to assist in emergency preparedness and incorporate feasible measures into the City Capital Improvement Plan.

79. Private water supplies for firefighting (GP policy PS15; target 2015; ongoing)
Encourage and assist homeowners in High Fire Hazard Areas to install their own emergency water supplies for firefighting operations. Assistance could include expedited permit review.

80. Floodplain mapping update (GP policy ER16.3; target 2020)
Update the Flood Insurance Maps (FIRM) floodplain boundaries for Special Flood Hazard Areas such as the Mission and Sycamore creek drainages and Area A near the Estero. Update maps to incorporate sea level rise forecasts.

81. Creek resources and water quality (GP ER15 - 15.4; plans 2025; ongoing to 2030)
Encourage development and infrastructure that is consistent with City policies and programs for comprehensive watershed planning, creeks restoration, water quality

protection, open space enhancement, storm water management, and public creek and water awareness programs.

a. *Comprehensive creek action plan.* Prepare a comprehensive long term action plan for protecting and enhancing creek water quality, riparian area, and steelhead use, and maintaining or enhancing flood management.

b. *Master drainage plan.* In coordination with watershed planning, develop a comprehensive drainage plan that identifies the existing system, policies and development standards to better address drainage and water quality issues, areas appropriate for drainage retention/detention, future capital improvements, and funding plan to finance the projects.

c. *Beach water quality improvement.* Consider actions for further improving water quality at East Beach, which could include: (1) a restoration plan for Lower Mission Creek/Laguna Channel, including the potential for a constructed wetland at the creek/ocean interface and/or (2) an ultraviolet treatment system to disinfect the flow within Laguna Creek during low flow periods (e.g., May-September) prior to entering the channel and discharging to the beach.

d. *Watershed action plans.* Continue work toward completion of Watershed Action Plans for Mission Creek, Sycamore Creek, Arroyo Burro Creek, and Laguna Watersheds.

Coastal vulnerability and adaptation planning

82. Monitoring, data collection, and analysis of sea level rise (City program; target 2020)
Develop the following data and analysis to support future sea level rise risk assessment, vulnerability analysis, and adaptation planning.

a. *Tide gauge.* Protect ongoing functioning of the NOAA tide gauge at the Santa Barbara breakwater to establish a long-term monitoring record of sea level changes.

b. *Sea cliff monitoring.* Establish a sea cliff monitoring program with surveyed transects that can be regularly monitored to document and track rates of cliff retreat.

c. *Beach profiles.* Establish a set of beach profiles (spaced at about 500 feet) from Leadbetter Beach to the Clarke Estate, and a set of winter and summer profiles from Cabrillo Boulevard to the shoreline, for annual surveys to track seasonal and long-term changes.

d. *Flooding and inundation.* Obtain detailed topographic mapping of low-lying areas of the City and the Airport (accurate to at least 12 inches, such as from State LiDAR satellite survey), and develop projected future flooding and inundation area maps to assist future adaptation planning.

83. Sea level rise risk assessment and vulnerability analysis (City program; target 2020)
Conduct periodic sea level rise studies that provide risk analysis indicating probability and magnitude of future impacts to Santa Barbara due to sea level rise to support future adaptation planning. Consider effects associated with storm flooding, beach and cliff erosion, permanent inundation, and groundwater contaminations. Consider short-term effects (storms), intermediate-term effects (to 2050), and long-term effects (to 2100).

84. Incorporate adaptation in development (GP ER1, ER4-4.1; target 2015, ongoing).
As applicable, private development and public facilities and services may be required to incorporate measures to minimize contributions to climate change and to adapt to climate changes anticipated to occur within the life of each project.

a. New public and private development or substantial redevelopment or reuse projects shall estimate the useful life of proposed structures, and, in conjunction with available information about established hazard potential attributable to climate change, incorporate adaptation measures in the design, siting, and location of the structures.
b. The City shall prepare adaptation guidelines for development projects, and to the extent of information available to the City, provide information about potential climate change hazards to developers.

85. Sea level rise adaptation (GP ER4.2; target 2020)
Identify policy options, costs, and consequences for addressing sea level rise issues, including:

a. Techniques to minimize wave energy and damage from storm surges, while minimizing disruption of coastal activities and habitats.
b. Review of City public improvements and utilities (aboveground and underground) for potential consequences of sea level rise, and consideration of means of adaptation such as measures to protect in place, raising facilities above projected flood heights, managed retreat or relocation of facilities, and pollution prevention.
c. Coordination with private property owners along the waterfront on techniques for structural adaptation and new design.

86. Future inundation (City program; target 2020)
Consider the following options in the development of adaptation plans for future permanent inundation effects:

a. Establishing mandatory rolling setbacks that move landward over time for future development or significant redevelopment in areas likely to be affected by sea level rise inundation within the expected lives of the structure.
b. Restricting rebuilding when structures are substantially damaged by sea level rise inundation and coastal storms.
c. Developing policies and identify funding or tax incentives to relocate away from areas subject to future sea level rise inundation.
d. Evaluating the costs, impacts, and estimated lifespan of a seawall along Cabrillo Boulevard and Shoreline Drive.

87. Bluff retreat guidelines (GP Policies PS10, PS10.1, PS10.2; target 2015)
All development and redevelopment, renovations and additions on bluff-top parcels shall consider the potential effects of climate change on bluff retreat for the life of the project.

a. *Sea cliff retreat formula.* Update the existing Safety Element and Local Coastal Plan bluff retreat formula to reflect updated information for the 75-year bluff setback line for use of siting development on sea cliffs. Once updated, monitor bluff retreat rates and update the formula as needed.

b. *Sea cliff development guidelines.* The following guidelines shall be used for development on sea cliffs, and incorporated into the Local Coastal Plan policy "Sea Cliff Retreat" #1:

1) Bluff setbacks shall be adequate to address long-term erosion and slope stability issues.

2) New development on top of a cliff shall be placed at a distance away from the edge of the cliff, such that potential accelerated rates of erosion and cliff material loss associated with climate change-induced sea level rise as projected by the State of California, or an area or site-specific geologic investigation that accounts for climate change, will minimize sea cliff-related impacts, and not seriously affect the structure during the expected lifetime.

3) The design life of new structures is presumed to be a minimum of 75 years. Exact future rates of accelerated sea cliff retreat are unknown, but are currently projected to be 12 inches per year, potentially accelerating to 1 to 3 feet per year if sea level rise progresses.

4) The City recognizes the need for owners of threatened coastal properties to perform maintenance and modest improvements to threatened coastal homes and other facilities. The City's goal is to minimize exposure of substantial new improvements to hazards of bluff retreat and avoid the need for installation of environmentally harmful coastal protection structures that could be requested to protect such improvements. To meet these goals, the following guidelines apply:

- Protection for existing structures shall first focus on techniques that avoid use of coastal protection structures including use of non-intrusive techniques such as drainage control, installation of drought tolerant landscaping, construction of cantilevered grade beam foundations, removal of threatened outbuildings, etc. Protection structures should use soft materials rather than hard.
- Relocation of threatened structures further inland on parcels shall be favored over installation of coastal protection structures.
- The siting of new major improvements shall consider accelerated rates of sea cliff retreat associated with climate change-induced sea level rise as projected by the State of California, or an area- or site-specific geologic investigation that accounts for climate change.

88. Cliff erosion policies (City program; target 2020)
Consider additional policies as part of future adaptation planning for sea cliff retreat.

a. Identify policy for relocation of structures as setback distance from cliff edge decreases and risk of failure increases.
b. Identify further policies or programs for control of drainage and runoff to reduce potential for sea cliff failures from terrestrial processes.

89. Shoreline management plan (GP policy PS10.3; target 2020; ongoing)
Develop a comprehensive Shoreline Management Plan to identify, manage and to the extent feasible mitigate or reduce climate change-induced sea level rise impacts on public facilities and private property along the City shoreline. Continue coordination with the Beach Erosion Authority for Clean Oceans and Nourishment (BEACON), the County, other South Coast cities, and UCSB to manage coastal issues including:

a. Protection/restoration of natural sand transport and sand supply replenishment projects;
b. Natural bluff restoration, stabilization and erosion control measures;
c. Non-intrusive methods to slow sand transport and retain sand along the beaches that front the City's bluffs; and
d. Funding mechanisms to implement beach replenishment and methods to reduce bluff retreat.

90. Beach erosion policies (City program; target 2020)
Consider the following policies as part of future adaptation planning for beach erosion.

a. Allow beaches to gradually retreat.
b. Utilize beach nourishment along with sand retention structures for maintaining beach width over near to intermediate term period.
c. Consider selective removal of back beach barriers to allow beaches to migrate landward.

91. ***Coastal ecosystems study*** (City/joint agency program; target 2020)
Seek grant funding for a joint research study in cooperation with other South Coast agencies to evaluate vulnerability and adaptation of coastal ecosystems to climate change effects, including consideration of wetlands, beach & sand dune habitats, riparian areas, intertidal zone, and offshore kelp forests.

Public services

92. Water supply planning (GP policy PS4; target 2015, ongoing).
The Long Term Water Supply Plan update process should assess and plan for potential water supply effects of climate change and identify feasible means of tracking the development of such impacts. *[Note: 2011 LTWSP update considered climate effects.]*

93. Regional cooperation on water supply reliability (GP policy PS7; ongoing).
Continue to work with the County and other jurisdictions to develop regional programs and projects to improve water supply reliability.

94. Local food cultivation (GP policies ER18, 19, 20, 21, 22; target 2030)
Support cultivation and marketing of local food.

a. *Farmers Markets.* Continue to support local farmers markets, and expand locations to include neighborhood locations consistent with Sustainable Neighborhood Plans, expand infrastructure to support them, and expand hours of operations.

b. *Gardener Education.* Continue to support the City/County/SBCC Green Gardener training program, and expand community and school educational programs for producing gardens year-round using sustainable gardening practices. Encourage the use of fruit trees in landscaping where appropriate.

c. *Food Scrap Recovery and Composting Program.* Continue and expand the City program for diversion of food scraps from landfill disposal, to be composted for use as soil amendments so long as economically viable.

95. Community gardens (GP policies OP1.5; ER21, ER22; target 2030)
Support establishment of community gardens.

a. *Community gardens on vacant land.* Establish a program for use of vacant or underutilized properties (not within creek setbacks) for temporary community gardens throughout the City, to enable residents who do not have access to land to grow food, orchards, or other crops.

b. *Public and Private Food Gardens.* Provide for infrastructure to support local community gardens. With neighborhood support, develop publicly-available edible landscaping in existing and new parks. Reserve space for public gardening within the urban core area to be maintained by the community. Design for green roofs and urban rooftop gardens in residential development Downtown.

c. *Food Gardens for Schools.* Work with the Santa Barbara School Districts to develop organic gardens at schools and a healthy and waste-free lunch program.

96. Regional agriculture (GP Policy ER23; ongoing to 2030).
Support regional coordination toward expanding local sustainable food sources. Support incentives for maintaining and establishing additional agricultural farms and farm stands within the City, the South Coast, and tri-county areas. Support directing local food to our schools, cafeterias, groceries, convenience stores, and restaurants.

Biological resources

97. Wildlife, coastal, & native plant habitat protection (ER12-12.5; target 2020, ongoing)
Protect, maintain, and to the extent reasonably possible, expand the City's remaining diverse native plant and wildlife habitats, including ocean, wetland, coastal, creek, foothill, and urban-adapted habitats.

a. *Designate habitats.* Map and designate important City upland habitats and wildlife corridors that merit long-term protection, enhancement, and preservation for habitat and wildlife values. Include criteria and monitoring objectives such as largest areas of contiguous coastal sage scrub (generally five acres or greater), oak woodlands (generally one-half acre or greater), perennial grasslands (generally 0.25 acres or greater), annual grasslands (generally five acres or greater), and important wildlife movement corridors.

b. *Multi-use plan for coast and native habitat restoration.* Develop updated multi-use plans and monitoring guidelines for publicly owned beaches and other coastal areas to provide for both recreational uses and protection of coastal habitats and wildlife/native plant species. Incorporate as part of the Multi-Use Plan, a Waterfront habitat and wildlife management program that provides measures to improve the extent and quality of native coastal habitats within the City Waterfront, with the following goals:

   1) Restoration and protection of remnant coastal sand dune habitat along the City Waterfront, including the removal of non-native and/or invasive plants.

   2) Restoration and enhancement of the estuaries of Mission and Sycamore creeks and the Laguna Channel, including appropriate revegetation and removal and control of invasive species. Measures should be considered to improve these estuaries where feasible to maximize biological productivity and ecological function taking into consideration the dynamics of ocean waves and currents and ongoing movement of sand along the City coast.

   3) A public access management plan that maintains public access to and along the shoreline, but channels the public to appropriate access locations as needed through sensitive habitat areas of the beach.

c. Coastal bluff habitat restoration program and protection

   1) Coastal Bluff Scrub Protection. Site and design new development or major remodels/expansions along the City coastal bluffs (including access, drainage, and landscape improvements) to:
      - minimize impacts to coastal bluff scrub habitat;
      - include provisions for habitat restoration of coastal bluff scrub habitats where development creates direct or indirect impacts to affected habitat;
      - provide compatible landscaping within 10 feet of the edge of the bluff or on the bluff face, consisting of appropriate native coastal bluff scrub species.

   2) Coastal Bluff Restoration. Establish a goal to restore 5.0 acres of coastal bluff habitat over the 20-year life of Plan Santa Barbara.

   3) Restoration on Publicly Owned Lands. Work to increase the acreage of coastal bluff scrub through restoration projects on publicly owned lands along Shoreline Park and the Douglas Family Preserve, and through providing education and assistance to private landowners to encourage the restoration of such habitats.

d. *Native species habitat planning.* Protect and restore habitat areas for native flora and fauna, and wildlife corridors within the City, including for chaparral, oak woodland, and riparian areas. In particular, provide land use/design guidelines to:

1) Require buildings and other elements of the built environment, and landscaping to be designed to enhance the wildlife corridor network as habitat.

2) Ensure that the City and new development preserve existing trees within identified wildlife corridors, and promote planting new trees, and installing and maintaining appropriate native landscaping in new developments within or adjacent to important upland wildlife corridors and all streams. Ensure that efforts are made to minimize disturbance to understory vegetation, soils, and any aquatic habitats that are present below the trees in order to provide movement of species that utilize the habitat.

3) Ensure that new development and redevelopment projects will not result in a net reduction or loss in size and value of native riparian habitats.

4) Increase riparian habitat within the City and / or its sphere of influence by 20 acres or more, and 1 linear mile or more, over the 20-year life of Plan Santa Barbara. Priorities for restoration include perennial reaches of the major streams, reaches of creek on publicly owned land, and degraded areas of the City's three major creeks.

e. *Riparian woodland protection*. Site new development outside of riparian woodlands to the extent feasible. Within and adjacent to riparian woodlands:

1) Avoid removal of mature native trees;

2) Preserve and protect native tree saplings and understory vegetation;

3) Provide landscaping within creek setback compatible with the continuation and enhancement of the habitat area, consisting primarily of appropriate native species and excluding use of invasive non-native species;

4) Include conditions of approval for habitat restoration of degraded oak woodlands where such development creates direct or indirect impacts to affected habitat;

5) Include water quality protection and enhancement measures consistent with the adopted City Storm Water Management Plan.

98. Open space connectivity and trails (OP1.2, ER13, OP1.3, OP2; OP2.3; target 2020, ongoing) Protect and enhance contiguous open space and connectivity.

a. *Open space preservation*. Identify key open space areas that merit long-term protection and take actions to preserve as passive open space, focusing on larger areas of contiguous open space.

b. *Trails management*. Existing and future trails along creeks or in other natural settings shall be managed for both passive recreational use and as native species habitat and corridors.

c. *Open space policies for development*. All new development within identified key open space areas shall be sited and designed to preserve contiguous tracts of open space and connectivity with open space on adjacent parcels, including connectivity of habitats and wildlife corridors.

d. *Open space funding*. Develop funding options to support acquisition and maintenance of public open space including access and connectivity between open spaces. Establish requirements that new development and redevelopment contribute commensurate with the incremental need generated.

e. *Regional open space*. Coordinate with the County of Santa Barbara, School District, and recreational service providers in the cities of Goleta and Carpinteria on regional open space protection.

99. Creek setbacks, protection, restoration (ER17, ER17.1-ER17.4; target 2020, ongoing)
Protection and restoration of creeks and their riparian corridors is a priority for improving biological values, water quality, open space and flood control in conjunction with adaptation planning for climate change.

a. *Creek setback standards*. Establish updated creek setback and restoration standards for new development and redevelopment along all creeks, and prepare or update guidelines for restoration, increase of pervious surfaces and appropriate land uses within designated creek side buffers.

1) Develop setback standards of greater than 25 feet from the top of bank for new structures and hard surfaces adjacent to creeks and wetlands.
2) At a given site, creek buffers should be adequate for protection from flood, erosion, and geologic hazards, and to provide habitat support.
3) In developing creek setback and restoration standards, consider applicable creek standards in surrounding jurisdictions and the Santa Barbara County Flood Control District general recommendation for new development setbacks of 50 feet from the top of bank of major creeks with natural creek banks, with a reduction up to 25 feet where “hard bank” protection is present.
4) For new development that is closer than 50 feet to the top of the bank of any major stream, creek bank stabilization shall be provided through planting of native trees and shrubs on creek banks and along the top of banks to minimize erosion and the potential for bank failure.
5) When the City determines that a structure must be constructed within proposed creek setbacks or where a project would be exposed to unusually high risk of bank erosion or collapse, non-intrusive bank stabilization methods such as bio-engineering techniques (e.g. revegetation, tree revetment, native material revetment, etc.) shall be used where feasible rather than hard bank solutions such as rip-rap or concrete.

b. *Creekside development guidelines.* Establish design guidelines for development and redevelopment near creeks, such as measures to orient development toward creeks, and better incorporate creeks as part of landscape and open space design. Utilize native riparian palettes for landscaping along creeks, and prohibit the use of non-native invasive plants. Encourage public creek side pedestrian paths where appropriate to increase connectivity and provide pocket parks and signage to improve public awareness and enjoyment of the City's creeks.

c. *Creek naturalization.* Prohibit the placement of concrete or other impervious material into or piping of major creeks and primary tributaries except for water supply projects or flood control projects that are necessary for public safety, or to maintain or repair a structure that protects existing development. These protection measures shall only be used for water supply or flood control purposes where no other less environmentally damaging method is available and the project has been designed to minimize damage to creeks, wetlands, water quality, and riparian habitats.

   Whenever feasible, existing concrete lining shall be removed from creek channels, and reaches of drainages that have been previously under-grounded shall be "day lighted".

d. *Surface water drainage restoration.* Set a goal to restore or daylight a total of at least .5 miles of surface water drainages over the life of Plan Santa Barbara. Priority areas for restoration include segments of Mission Creek consistent with sound flood control practices, the reach of Arroyo Hondo Creek through City College, the tributary to Arroyo Burro Creek west of Las Positas Road, and the segment of Arroyo Burro Creek adjacent to La Cumbre Plaza.

Also see tree and vegetation protection measures in carbon reduction strategies (Section 2.3 vegetation).

Local economies

100. Coordinate with local business sectors (City program; 2015,ongoing)
Include local industries that may be affected by climate changes, including fisheries and tourism, in adaptation planning processes.

4.0 Plan Implementation, Monitoring and Update

This section discusses implementation of the climate plan. The following information is provided:

4.1 Plan Implementation: Identifies City Departments and programs that will undertake climate plan measures and target dates for implementation; and describes application to individual project design and permitting; and environmental review.

4.2 Monitoring and Plan Update: For carbon emissions reduction, plan implementation status will be tracked, carbon emissions inventory changes will be monitored, and progress compared to targets. For climate adaptation, plan implementation and climate change indicators will be monitored. Periodic updates of the climate plan will be slated.

4.1 Plan Implementation

The following discusses implementation of climate plan measures over the next decades to reduce community carbon emissions and to plan for climate adaptation. Plan strategies are implemented through City government operations programs, communitywide measures, and development permitting processes. There will also be monitoring and reporting on plan implementation and measures of climate change, and periodic update of climate plan objectives and programs.

4.1.1 City programs

As identified in the climate plan, the City has undertaken many activities in the past decades that will benefit carbon reduction and adaptation planning, both for City government operations and the larger community. Many in-place and future programs will be ongoing through the planning period to 2030.

Future carbon reduction and adaptation planning measures identified in the City climate plan will be undertaken in the coming years by a variety of City departments and divisions. These include the Community Development Department (Planning and Building & Safety Divisions); Public Works Department (Facilities & Energy, Water Resources, Transportation, and Engineering Divisions); Waterfront Department; Airport Department; Parks & Recreation Department (Parks and Creeks Divisions); Environmental Services/Solid Waste Program; and Fire Department (Fire Prevention and Emergency Operations Divisions). Many of the future climate plan measures are policies and programs adopted in the December 2011 Santa Barbara General Plan update.

Some programs will also be joint ventures undertaken in coordination with regional agencies and programs, such as the Sustainable Communities Strategies process underway by the Santa Barbara Association of Governments. Implementation of carbon-reducing and adaptation measures will also be carried out by private individuals and businesses.

City actions will be taken up whenever possible as part of existing, ongoing City operations and programs, as budgets allow and are authorized through the annual budget process. Grant funding will continue to be pursued to assist in financing the implementation of climate plan measures.

The following charts (Figures 4-1 and 4-2) identify overall implementation time lines for carbon reduction measures and adaptation planning measures, with target dates of 2015, 2020, 2025, or 2030 within the climate plan 2030 planning horizon.

Figure 4-1 Climate Plan Implementation Time Line – Emission Reduction Strategies			
CLIMATE PLAN STRATEGY	**TARGET YEAR**	**CLIMATE PLAN STRATEGY**	**TARGET YEAR**
Energy efficiency and green building measures		35. Development impact fees	2015
1. Energy-efficient City facilities	ongoing	36. Street widths	ongoing
2. Recreational field lighting efficiency	2015	37. New development vehicle emissions	2015
3. Energy-efficient buildings–voluntary actions	ongoing	38. Marine shipping emissions	ongoing
4. Energy-efficient buildings–further actions	2025	***Vegetation measures***	
5. Green building	ongoing	39. Tree planting	2030
Renewable energy measures		40. Street trees	2015, ongoing
6. Hydroelectric plant re-commissioning	2015	41. Tree and landscaping protection	2015
7. Solar photovoltaic project at Airport	2015	42. Urban heat island effect	2020
8. Community choice aggregation	2015	43. Regional open space preservation	ongoing
9. Alternative/advanced fuels	2020, 2030	***Waste reduction measures***	
10. Alternative fuel infrastructure	2015	44. City business purchasing guidelines	2015
11. Small wind generators	2020	45. City facilities recycling	2015
12. Facilitate renewable energy technologies	2020	46. Electronic processes	2015
13. Solar energy	ongoing	47. City coordination with region	2020
Travel and land use measures		48. Waste-to-energy facility at landfill	2015
14. Fleet vehicles	ongoing	49. Communitywide waste diversion	2020
15. City employee travel changes	ongoing	50. Regional material recovery facility	2015
16. Mixed use land use policies	2015	51. Waste audit information for business	2015
17. Sustainable neighborhood plans	2020, 2030	52. Recycling education campaigns	2015
18. Experimental development	2015	53. Single-use packaging reduction	2015
19. Complementary land uses	2020	54. Business & MF recycling ordinance	2015
20. Electric vehicle charging stations	2015	55. Construction waste enforcement	2015
21. Pedestrian infrastructure	ongoing	56. Increased recyclables sorting	2015
22. Bicycle infrastructure improvements	2015, ongoing	57. School waste diversion	2015
23. Personal transportation	2020, ongoing	58. Materials reuse/recycling for builders	2015
24. Inter-model connections	ongoing	59. Building space guidelines for waste	2015
25. Optimize roadway capacity, flow	ongoing	60. Additional recycling materials	2020
26. Mid-block traffic improvements	ongoing	61. Additional green waste capacity	2020
27. Regional transportation and transit	ongoing	62. Additional recycling in public places	2020
28. Vehicle speeds	2015	63. Additional composting	2020
29. Bus pull-out right of way	2015	64. Single-use bag reduction	2015
30. Circulation improvements	ongoing	***Water conservation measures***	
31. Transit passes	ongoing	65. City facilities – water conservation	ongoing
32. Parking policies	ongoing	66. Community water conservation	2015, ongoing
33. Car-pooling and telecommuting	ongoing	67. Recycled water	2020, 2030
34. Car-sharing	ongoing	68. On-site water storage and reuse	2020

Figure 4-2 Climate Plan Implementation Time Line – Adaptation Strategies			
Climate Plan Strategy	**Target year**	**Climate Plan Strategy**	**Target Year**
Climate change adaptation planning		85. Sea level rise adaptation	2020
69. Planning for adaptation	2020, 2030	86. Future inundation	2020
70. Coordination of climate planning efforts	ongoing	87. Bluff retreat guidelines	2015
Emergency preparedness		88. Cliff erosion policies	2020
71. Emergency response strategies	2015	89. Shoreline management plan	2020
72. Emergency workforce	2015	90. Beach erosion policies	2020
73. Public education for emergencies	2015	91. Coastal ecosystems study	2020
74. People with disabilities	2015	***Public services***	
75. Community resilience planning	2020	92. Water supply planning	2015, ongoing
Wildfire, flooding, water quality		93. Regional cooperation - water supply	ongoing
76. Residential development – high fire hazard	2015	94. Local food cultivation	2030
77. Fire prevention and creek restoration	2015	95. Community gardens	2030
78. Water system improvement for firefighting	ongoing	96. Regional agriculture	ongoing
79. Private water supplies for firefighting	ongoing	***Biological resources***	
80. Floodplain mapping update	2020	97. Wildlife and habitat protection	2020, ongoing
81. Creek resources and water quality	2025, ongoing	98. Open space connectivity and trails	2020, ongoing
Coastal vulnerability and adaptation planning		99. Creek protection, restoration	2020, ongoing
82.Sea level monitoring, data, analysis	2020	***Local economies***	
83. Sea level risk assessment and vulnerability	2020	100. Coordinate with local business	2015, ongoing
84. Incorporate adaptation in development	2015, ongoing		

4.1.2 Individual development project design and permitting

Some climate plan measures will be applied to new development through the City development design and permitting processes. These may include project design measures that would reduce carbon emissions, and measures to avoid or address reasonably foreseeable future climate-related hazards at specific locations.

A number of City programs, guidelines, and ordinances already in place provide guidance for individual project development design and permitting for energy conservation and green building, land use, transportation design; tree protection and landscaping, waste reduction, water conservation, and adaptation.

Appendix C provides initial guidance for including carbon reduction and climate adaptation measures in project design and permitting, as applicable. This chart will be updated as additional guidelines are developed.

Additional project guidelines

Several future Climate Plan measures direct the preparation of additional guidelines and incentives that would assist developers and City reviewers in applying project development design measures to address climate issues, as summarized below:

Carbon reduction strategies

- Energy strategies. Measures 3 and 4-Energy-efficient buildings; 5-Green building; 12-Incentives for alternative fuel infrastructure; 11-Small wind generators
- Travel & land use strategies. Measures 16-Mixed-use land use policies; 17-Sustainable neighborhood plans; 18-Experimental development; 19-Complementary land uses; 20-Electric vehicle charging stations; 32-Parking policies; 37-New development vehicle emissions.
- Vegetation strategies. 41-Tree and landscaping protection; 42-Urban heat island effect.
- Waste reduction strategies. Measures 59-Building space guidelines for waste management.
- Water conservation strategies. Measures 65-Community water conservation; 66-On-site water storage and reuse.

Climate change adaptation planning

- Measure 69-Planning for adaptation
- Wildfire, flooding, water quality. Measures 76-Limit residential development in high fire hazard areas; 77-fire prevention and creek restoration; 79-private water supplies for fire-fighting; 80-floodplain mapping update; 81-Creek resources and water quality
- Coastal vulnerability. Measures 82-Monitoring, data collection, analysis of sea level rise; 84-Incorporate adaptation in development; 85-Sea level rise adaptation; 86-Future inundation; 87-Bluff retreat guidelines; 88-Cliff erosion policies
- Biological resources. Measures 97-wildlife, coastal, & native plant habitat protection; 98-Open space connectivity and trails; 99-Creek setbacks, protection, restoration

4.1.3 Environmental review

Environmental review of climate plan

The General Plan Program EIR (2010) provided an initial analysis of carbon emissions impacts from future citywide growth under General Plan land use designations and policies, as well as impacts of climate changes on Santa Barbara. The EIR identified the citywide impact significance threshold as whether or not citywide carbon emissions levels would meet established State targets.

An Addendum to the EIR provides documentation of environmental review of this Santa Barbara climate action plan per the requirements of the California Environmental Quality Act (CEQA). The climate plan provides a refined analysis of carbon emissions impacts that updates the Program EIR analysis.

The climate plan demonstrates that current annual citywide carbon emissions generation levels, as well as projected 2020 and 2030 levels with implementation of climate plan strategies, more than meet the State's 2020 target for overall emissions reductions and the State's regional Santa Barbara County 2020 and 2030 targets for per capita vehicle emissions levels.

The EIR Addendum concludes that in the period to 2030, City activities including new development under the General Plan will not result in a considerable contribution to climate change. The climate plan also summarizes potential future climate effects on the City, consistent with the Program EIR analysis.

Environmental review of individual projects

State legislation, case law, and regulatory guidelines have been evolving over the past several years as to how climate change issues will be addressed as part of environmental review of individual projects under California Environmental Quality Act (CEQA) procedures.

SB 97 amended CEQA to require that carbon emissions be evaluated as part of CEQA environmental review. As allowed under SB 97, the City has now analyzed and identified mitigation for potential significant effects of carbon emissions on a programmatic, citywide level through this Climate Action Plan and the Program EIR and Addendum.

Upon adoption, this climate plan will function as a cumulative mitigation program for climate change effects for the City of Santa Barbara, which will removes the cost quantified analysis by some individual project applicants.

4.2 Monitoring and Plan Update

The following discusses monitoring and reporting on plan implementation status, citywide carbon emissions inventory, and measures of climate change, as well as periodic climate plan update.

4.2.1 Climate plan monitoring and reporting

The climate action plan contains many programs also recently included in the 2011 General Plan update. The General Plan includes an AMP component (Adaptive Management Program) for monitoring and reporting on General Plan implementation status and indicators of community sustainability. This will allow for reassessment and adjustment of General Plan policies. The AMP process and schedule is slated for forthcoming development.

To avoid duplication of effort, climate plan monitoring and reporting will be coordinated with the General Plan AMP. In addition, wherever possible, monitoring will utilize already existing City processes. For example, for the issue of water supply, the Water Resources Division already provides an annual water supply report to City Council, which will also inform the climate plan status report.

Plan implementation

Monitoring and reporting on the implementation status of climate plan strategies for carbon emissions reduction and climate adaptation will occur with the same schedule and process established for AMP monitoring and reporting of General Plan implementation status (e.g., annual report to Planning Commission and City Council or other schedule as established).

Figures 4-1 and 4-2 in the prior section provide schedule targets for implementation of climate plan strategies.

Carbon emissions inventory and measures of climate change

Implementation status reports in 2015, 2020, 2025, and 2030 will include the following additional monitoring information:

- An update to the citywide carbon emissions inventory and comparison with 2020 and 2030 targets; and
- Updated information on climate change and future projections (e.g., temperature, rainfall, storms and flooding, sea level rise, sea cliff retreat rates, biological resources, etc.).

These more comprehensive climate plan status reports will be provided to the Planning Commission and City Council and will be available online for public access.

4.2.2 Plan updates

Within the climate plan period through 2030, plan provisions can be reassessed and amended as needed as a part of the regular monitoring and reporting process.

A comprehensive update to the Climate Action Plan is targeted for 2030, concurrent with other key City long-range planning documents, including the General Plan and Long Term Water Supply Plan.

5.0 References

The References section identifies:

- *Climate Plan Preparers*
- *Source Document References*

Photo by Damian Gadel

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